



# 21st Century Learning Environments

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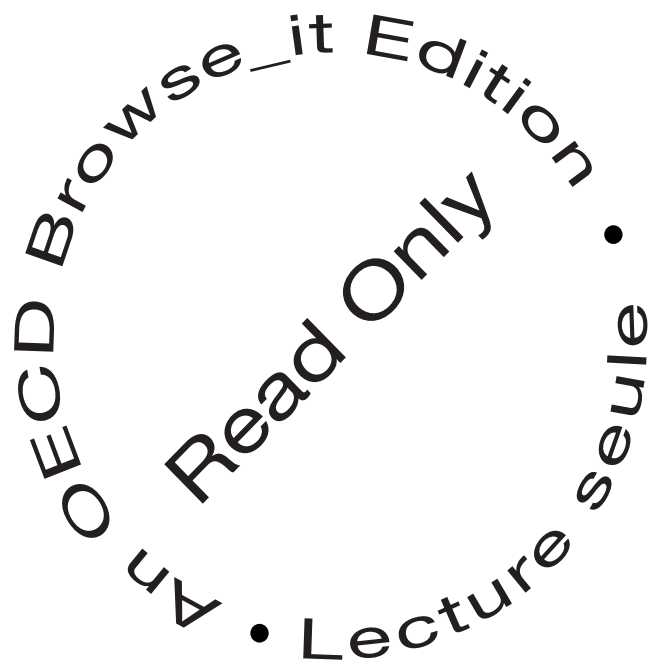
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# 21<sup>st</sup> CENTURY LEARNING ENVIRONMENTS

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## FOREWORD

In the early years of this still new century, the role of education in the knowledge society has been reaffirmed. Educational facilities, which provide innovative learning environments for tomorrow's knowledge workers and the wider community, are more important than ever. The principles of lifelong learning, inclusion, integration, sustainability, connectivity and quality have become catchphrases of educational policy in all OECD countries, and those responsible for designing educational facilities are responding in new and exciting ways.

Today, the word "school" does not capture the rich purpose and function of new and existing learning environments. A school can be a space centre, equipped with the latest technologies to simulate man's exploration of the universe. A school can be a vocational training centre, where adults can improve their work-related skills after school hours and on the weekend. A school can be a place where communities gather to receive medical care and other support services, to watch exhibitions, to perform and to play sport. A school, through information and communications technology, can serve to link communities in isolated areas, creating virtual learning communities. Individual elements of a school such as an eco-garden or DNA-spiral staircase can be learning tools themselves, fostering enquiry-based learning skills and teaching students about the impact of facilities on their immediate environment. Finally, school design is not only an architect's conception; it can also embody the creative vision of students, the practical necessities of teachers and the enthusiasm of communities.

Drawing on material presented at an international conference in London on "Creating 21<sup>st</sup> Century Learning Environments", this report captures the spirit of innovation and excellence in educational facilities design today using case studies from Australia, Canada, New Zealand, Singapore, Switzerland, the United Kingdom and the United States.

It also reflects an exciting period in educational facilities design in the United Kingdom as the government is significantly increasing capital funding for schools in an effort to raise educational standards. Through a number of building programmes promoting innovative design, the UK Department for Education and Skills is committed to creating attractive, imaginative and stimulating – yet safe and secure – learning environments. This report showcases a host of exemplary schools in the United Kingdom, several of which were visited by participants at the conference.

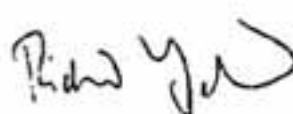
Many of the facilities presented here demonstrate how governments, architects, facilities managers, teachers, students, parents and communities are working together to enhance existing quality learning environments and create new ones. By sharing innovative experiences and practice in educational facilities design, we can challenge traditional design concepts, inspire an emerging generation of designers and facilities users, and alert governments to the role of great design in improving educational quality.



Mukund Patel

Head, Schools Capital (Assets) Division,  
Department for Education and Skills, United Kingdom

Chair, OECD Programme on Educational Building  
Governing Board



Richard Yelland

Head, OECD Programme on Educational Building

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# INTRODUCTION

*The aim of this work is to present the best of the present, analyse the needs of the future, visit schools set in the real world, promote an exchange of ideas and experiences, and inspire for the challenges ahead.*

(Richard Yelland, OECD/PEB, at the conference "Creating 21<sup>st</sup> Century Learning Environments")

From 26 to 28 May 2004, the OECD Programme on Educational Building (PEB) and the Department for Education and Skills (DfES), United Kingdom, organised an international conference on "Creating 21<sup>st</sup> Century Learning Environments". The event took place at the Hilton Hotel, Croydon, United Kingdom.

Over 130 participants from 22 countries attended the conference, representing a broad cross-section of professionals in research and design of school buildings, including administrators, educators, academics, teachers, architects, engineers and facility planners.

The general objective of the conference was to investigate how different countries define and use innovative design in past and present learning environments, and to discuss how current trends and approaches in innovative design will affect future learning environments.

The report is arranged in three sections. The first section explores seven emerging themes concerning the role of innovation in school design. The second section describes the presentations made at the conference. The third section presents visits to educational facilities in the London area.

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# SECTION I

## EMERGING THEMES



*In our post-modern era, new understandings of learning, influences of information and communications technology and the employment requirements of the knowledge society have placed pressures and questions on the traditional provisions of education. New purposes of schooling have evolved. (Andrew Bunting, presenter)*

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## Theme 1. The challenge of designing schools in a changing world



As education systems develop and respond to the demands of the new knowledge society, school design is facing a number of challenges. The designs in this theme address the following questions:

- How can school design best meet the needs of 21<sup>st</sup> century learners and educators?
- How can new and existing built environments best accommodate increasingly diverse teaching and learning environments?
- Are governments investing in new educational facilities for the 21<sup>st</sup> century?
- How can design transform existing facilities to achieve future educational goals?



Chart 1.1. Internal courtyard, The Business Academy, Bexley, United Kingdom  
*Modern, flexible, open learning spaces.* At Bexley, teaching spaces are visually and functionally linked: Transparent and compact spaces encourage integration and communication. Teaching spaces are separated by adjustable partitions. There are no corridors; circulation occurs through the courtyards on each level. (See also pages 82-83.)



## Creating flexible spaces for flexible learning

*Form does not always follow function. School buildings could fail us if they cannot be adapted to suit new learning styles.* (Andrew Bunting, presenter)

More interactive models have replaced the traditional teacher-centred model of learning to place students and teachers at the centre of the educational process. School design has an important role to play in facilitating innovative pedagogical methods.

Educational spaces must be sufficiently flexible to accommodate an ever-increasing range of teaching and learning scenarios and technologies. To best facilitate flexible learning environments, new and existing facilities must consider:

- **Space for group learning.** Large spaces need to be broken down into smaller units to facilitate group work and cross-curricular learning, and to cater to students with different learning styles.
- **Space for individual learning.** Schools can allocate areas for personal study with individual desks.



Chart 1.2. Classroom, Lake Country School, Minneapolis, Minnesota, United States  
*Individual and group learning spaces.* In this school, which was renovated in 1999, children of different ages work alone or in groups in one classroom. Older students serve as models for the younger children, who help them as needed. These rooms are designed with domestic finishes and furniture aimed at providing students with individual learning environments. (See also pages 70-71.)





Chart 1.3. New quadrangle, Carey Baptist Grammar Senior School, Melbourne, Australia  
*Open, multi-purpose spaces.* This quadrangle was designed to create a pre-tertiary setting for senior students, serving as a centre for social interaction and relaxation, accommodating up to 750 students and staff. The canteen provides food and drinks to staff and students throughout the day, and also serves as a reception centre and restaurant for school-based evening functions. The quadrangle enables different sports clubs within the school to hold functions and offers various musical ensembles and rock bands the opportunity to perform to larger groups. Photo by Peter Hyatt.

- **Open, multi-purpose spaces.** Open areas can serve as social spaces, open access learning areas, quiet study areas or central briefing areas.
- **Specialised spaces.** Design provision must be made for specialised activities such as vocational training, sport and the performing arts.



Chart 1.4. Play room and flexible classroom, Watgate Primary Special School, Lewisham, United Kingdom  
*Stimulating specialised spaces.* This new school houses numerous specialised, flexible spaces for students with profound multiple learning difficulties. It contains physiotherapy, medical and training rooms for outreach; therapy rooms, including one white and one dark sensory room and soft play room; an infant and junior suite for students with autism; and a 140 m<sup>2</sup> hydrotherapy pool. The school also contains a library, and separate rooms for projects, art, technology and music. (See also pages 102-103.)





**Chart 1.5. Construction of Alfriston College, Auckland, New Zealand**  
*New school construction in New Zealand.* Alfriston College, a recently-constructed secondary school located near Auckland, has a capacity of 1 500 students. When it opened in January 2004, it was the first state secondary school built in New Zealand in over 20 years. (See also pages 68–69.)

## Investing in future educational facilities

*To ensure that our school buildings provide us with a better environment for teaching and learning, we need to ensure that all of the capital going into modernising and renewing buildings is being effectively invested to deliver excellent facilities for today and tomorrow.* (Chris Bissell, presenter)

Governments in several countries are investing in a new generation of school buildings:

- In **New Zealand**, three new secondary schools are under construction. The last new school was constructed over 20 years ago. Considerable research on contemporary school design and discussion with stakeholders was thus required to create the most effective learning space for today's learners and educators. (See also pages 60–61.)
- In **Switzerland**, over the last decade, the Canton of Geneva has invested significant resources in constructing, renovating and transforming primary schools. In 1994, primary education reform legislation led to the reconsideration of the 1989 school building regulations. The reform advocated team teaching, which replaced the former practice of teachers working alone in the classroom. The implications of the reform for design were the extension of building plans to include decompartmentalised or flexible open-plan teaching spaces. (See also pages 62–63.)
- In the **United Kingdom**, many existing school buildings were constructed during a large post-war investment in school infrastructure to meet the demands of a growing population. Many of these buildings do not meet today's standards. Over the next 10 to 15 years, investment in school buildings is estimated at GBP 5.1 billion per year. (See also pages 74–75.)

**Chart 1.6. Multi-purpose classroom, Ecole de Monthoux, Geneva, Switzerland**

*Transforming classrooms in Geneva.* The concept behind this primary school, opened in 2002, was to facilitate flexible teaching by creating an open, multipurpose space at the front of the classroom separated by a glass partition. The area has its own special furniture, which is different from the classroom furniture. (See also pages 62–63.)

**Chart 1.7. Increase in capital expenditure in the United Kingdom (1996–2008)**

*Investing in educational facilities of the future.* In the United Kingdom, there has been a substantial increase in investment in school buildings in the last decade. (See also pages 74–75.)

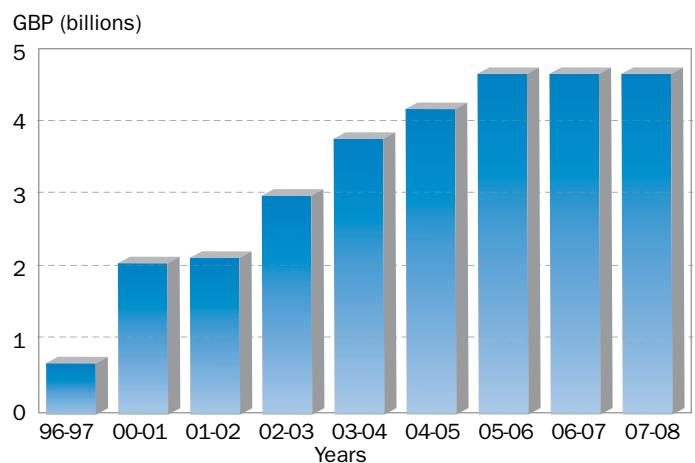






Chart 1.8. City and Islington College, Centre for Lifelong Learning, Finsbury Park, United Kingdom

*Combining Victorian architecture with contemporary design.* This partly-rebuilt, partly-refurbished learning centre in North London demonstrates how an historic school building can be successfully remodelled to become a local landmark, accommodating the latest teaching pedagogies and equipment. The atrium, shown here, is created within the Victorian building and is bridged by a steep ramp and stairs connecting the different levels of old and new buildings. The spatial diversity of old and new buildings is complemented by the courses taught in each building: more technology-based courses are held in the new building, while building, pottery and massage classes are taught in the lofty spaces in the old building. (See also pages 86–87.)

## Transforming existing educational facilities

*Developing existing schools can create opportunities as well as challenges. Any new development should allow space for future expansion.* (Pauline Nee, presenter)

While many older schools can be successfully remodelled to accommodate new pedagogical methods, others do not allow for flexible use of space. In some cases, school buildings constructed more than 100 years ago can be more easily adapted than other, more specialised facilities constructed in the last 30 years.



Chart 1.9. Winkleigh Primary School, Devon, United Kingdom

*Remodelling existing buildings.* This primary school is one of a series of steel-framed schools constructed in Devon in the mid-1970s, containing small, interlinked classrooms inappropriate for today's teaching and learning requirements. The remodelled building, constructed as part of the "Classrooms of the Future" initiative, contains one large flexible space that can be divided into two individual workspaces. The classroom can be used after school and at weekends as a community facility. (See also pages 54–55.)

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## Theme 2. The impact of new technology on school design



The introduction of information and communications technology (ICT) is changing the way we live, work, teach and learn. It is also challenging the notion of traditional institution-based learning. Will the realisation of the full educational potential of ICT make institution-based learning obsolete, or will tomorrow's schools become high-tech, multi-functional community learning centres? The designs in this theme address the following questions:

- How can ICT best serve to stimulate students' interest in learning?
- How does the increasing demand for ICT provision in educational facilities challenge future school design?
- How can incorporating ICT in educational facilities design facilitate lifelong learning?
- How can facilities equipped with ICT increase access to learners of the future?





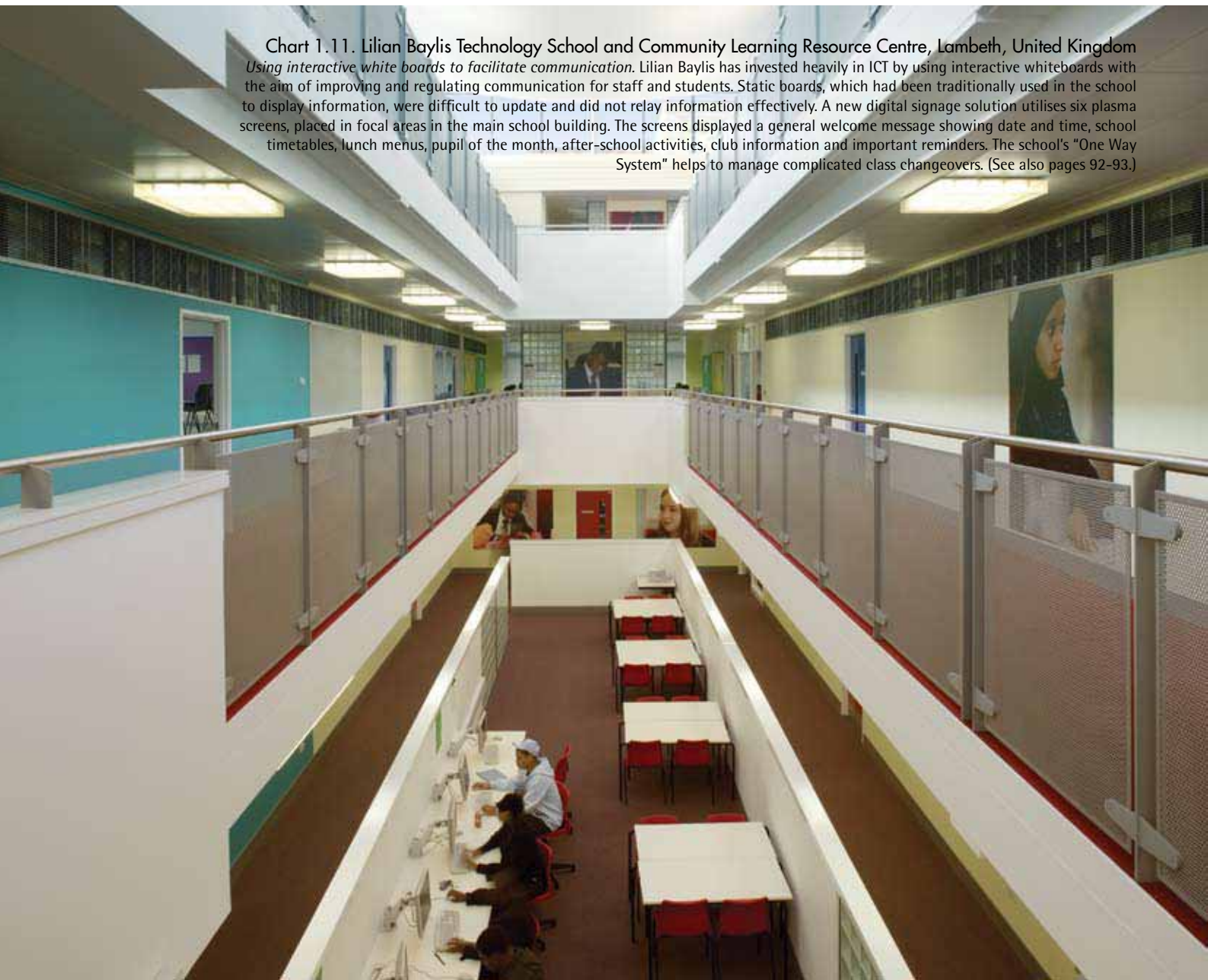
**Chart 1.10. Yewlands Secondary School, Sheffield, United Kingdom**

*Installing a new technology facility to promote independent learning.* In this "Classrooms of the Future" project, a new technology facility linking two existing blocks will replace outdated technology spaces designed in the 1960s. Learning in the facility will be controlled virtually. Students will be briefed at the start of the lesson in a central space for 22 students, which will contain a large whiteboard and lightweight wireless laptops for each student. The walls will open up to provide a large forum, with zones for two to three students to undertake focused activities. (See also pages 54-55.)

## Increasing students' enjoyment of learning through ICT

*ICT should be about making learning more delightful. Similarly, design should challenge and channel students' creative efforts in new and interesting ways.* (Stephen Heppell, presenter)

Information and communications technology (ICT) is provoking children to think, create and solve problems in new and innovative ways, thus providing opportunities for both students and teachers to think "outside the box": to be creative and collaborative in their approach to learning. Design has an important role to play in harnessing these new creativities and capabilities by providing a student-centred learning environment that looks beyond the traditional classroom.



**Chart 1.11. Lilian Baylis Technology School and Community Learning Resource Centre, Lambeth, United Kingdom**

*Using interactive white boards to facilitate communication.* Lilian Baylis has invested heavily in ICT by using interactive whiteboards with the aim of improving and regulating communication for staff and students. Static boards, which had been traditionally used in the school to display information, were difficult to update and did not relay information effectively. A new digital signage solution utilises six plasma screens, placed in focal areas in the main school building. The screens displayed a general welcome message showing date and time, school timetables, lunch menus, pupil of the month, after-school activities, club information and important reminders. The school's "One Way System" helps to manage complicated class changeovers. (See also pages 92-93.)





Chart 1.12. Camden's fully mobile ICT classroom, United Kingdom

*Transporting ICT to schools and communities in Camden.* This mobile prototype ICT classroom, developed through the "Classrooms of the Future" project, will provide a self-sustainable virtual learning community to schools throughout Camden. The classroom is transportable on a standard articulated lorry platform and expands when stationary to maximise the internal space available. In doing so, natural light is filtered in at high level where the shell-like exterior is parted. One end of the vehicle drops down to allow easy access. All furniture and seating is integrated with the interior and can be moved to allow different activities to take place. It features high speed, broadband connection to the Internet; interactive whiteboards linked to the Internet; virtual reality tools and image projection; and high quality video conferencing equipment. (See also pages 54–55.)

## ICT providing challenges for future design

*School buildings must be as adaptable as possible in order to keep pace with the rapidly changing requirements of the world of ICT.* (Mukund Patel, presenter)

Electronic whiteboards, broadband access, laptop computers and wireless networks have already significantly altered the way students learn and teachers teach. In most countries, governments have moved quickly to integrate these new technologies into new and existing educational facilities. But is school design sufficiently flexible to continue to respond to the development and integration of new technologies in society and the educational process?

Chart 1.13. Hobart High School (left) and Thurlton Primary School (centre and right), Norfolk, United Kingdom

*ICT linking schools in rural communities in Norfolk.* Norfolk is one of the largest Local Education Authorities in the United Kingdom, with more than half of its population living in a rural setting. Through the involvement of these two Norfolk schools in the "Classrooms of the Future" project, new technologies such as video conferencing are increasing opportunities for students and staff in cluster schools to interact, removing the need to travel and reducing energy costs, and allowing the sharing of expertise and the achievement of consistency in curriculum planning and delivery. (See also pages 54–55.)

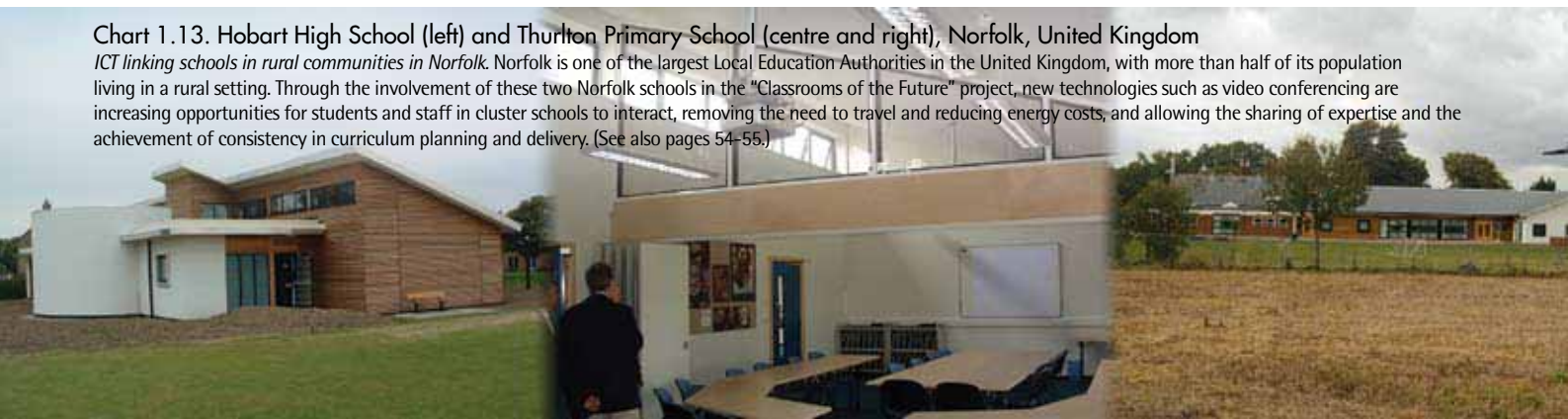






Chart 1.14. Tanaka Business School, Kensington and Chelsea, United Kingdom  
*Installing the latest technologies in an innovative building design.* The most striking feature of this recently opened business school, which serves as the new entrance to Imperial College, London, is a six-storey circular stainless steel drum containing circular, traditional and Harvard-style lecture theatres that are equipped with the most advanced technologies. (See also pages 100–101.)

## Facilitating lifelong learning through ICT

*City Learning Centres in the United Kingdom are located in inner city areas and shared by both school and community.* (Mukund Patel, presenter)

Today, ICT skills – from completing a simple search on the Internet and writing an essay in Word, to cutting a video and designing a Web page – are a prerequisite for entry into the workforce. Schools have an important role to play in providing students with the necessary skills to become tomorrow's knowledge workers. Increasingly, governments are investing in facilities within existing schools or creating new learning centres than can serve the needs of the broader learner community.



Chart 1.15. City Learning Centre, Bristol, United Kingdom  
*Building learning communities through ICT.* The objective of the "Excellence in Cities" initiative is to establish a network of school-based City Learning Centres (CLCs) in the United Kingdom. All CLCs will provide the latest ICT-based learning tools for students at the host school, in the network of surrounding schools and for the wider community. The Bristol CLC won the prime minister's Better Public Buildings Award in 2002. (See also pages 74–75.)







Chart 1.16. ICT trolleys, Reece High School, Devonport, Tasmania, Australia, and Alfriston College, Auckland, New Zealand

*ICT anytime anywhere in the school.* Students at Reece and Alfriston share PCs on trolleys, rather than using individual laptops. At Reece, each laptop is stored in a padded slot, 26 computers are stored on two hinged shelves and re-charging power is supplied on a retractable cord. Alfriston, which is networked for cable and wireless communication, has also invested in a hardware and software sound control package that delivers a “soundscape” or a variety of up to eight sound environments through 320 speakers throughout the campus. (See also pages 68–69.)

## Increasing access to education through ICT

*Today, it is possible for 3 500 students in a single school to access different sites. A distributed school, comprising for example three rural areas, can be joined together to form a global school.* (Stephen Heppell, presenter)

Information and communications technology offers unlimited scope for improving access to education both within and between schools. The use of mobile equipment enables students to maximise use of and access to ICT in the same school. Tools such as wireless connections and interactive multimedia can connect schools located in remote areas to school communities in neighbouring towns or cities anywhere in the world. ICT can also help teachers in isolated areas access the latest teaching resources. For students with special educational needs, ICT can also serve to significantly improve access to education.

Chart 1.17. Installations of a fibre-optic network and Remote School Network project, Quebec, Canada

*ICT linking schools in rural communities in Quebec.* In Quebec, 440 of its 3 000 schools have less than 100 students. To preserve rural schools, in 2001 the Ministry of Education launched a programme to install a fibre-optic network linking all of its schools. A Remote School Network project, involving three pilot schools in rural areas and seven partner schools, uses the latest technologies to transform individual (e.g. headphones, microphones and Web cams) and group work (e.g. video conferencing). (See also pages 56–57.)



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## Theme 3. Increasing access to education through school design



Schools communities can serve as models and catalysts for societal change and integration. An educational facility that is designed to facilitate access to education for all – students with special educational needs, students from minority and disadvantaged groups, and the community in general – all year round sends a powerful message to tomorrow's knowledge workers and community leaders. The designs presented in this theme highlight the following issues:

- How can schools of the future maximise accessibility to the communities they serve, particularly people with special educational needs and disadvantaged groups?
- How can school design incorporate other, non-educational services, which are available to the wider community outside school hours?
- How can design facilitate integration of staff and students within the same school?





**Chart 1.18. Lilian Baylis Technology School and Community Learning Resource Centre, Lambeth, United Kingdom**

*Facilities for the community.* The site of this school, in which 600 secondary students are enrolled, is shared by a Community Learning Resource Centre located on the ground floor level of the building. Functioning as a new centre of excellence, it supports young people aged 16–25 with severe learning difficulties. (See also pages 92–93.)

## Designing inclusive schools for communities

*There is a large movement towards community involvement, to encourage many adults who failed in school in the past to complete their education thus breaking down the potential isolation of living in an urban community.* (Pauline Nee, presenter)

Many schools serve as focal points in the community, bringing together individuals and groups with diverse educational, vocational and other needs from a wide range of social and cultural backgrounds. Design has an important role to play in opening up schools to communities and other groups who can use the facilities for a variety of purposes before and after school hours, and on weekends.

**Chart 1.19. Whanau house system, Alfriston College, Auckland, New Zealand**

*Fostering intra-school and community relationships.* "Whanau" is the Mauri term for family. At Alfriston, each of the five Whanau, or "schools within schools", are located in a two-storey building that functions as a community of up to 300 students and teachers. In each building, learning spaces are clustered around a general-purpose area that contains lockers, toilets, kitchen facilities and furniture. Student leadership is supported and nurtured within the Whanau, and students feel a greater sense of belonging in the "school-within-a-school" environment. Families also enjoy a close relationship with the Whanau. At Alfriston, the wider community is encouraged to use school facilities such as the theatre, "Marae" (ceremonial meeting house), cafeteria and gymnasium. (See also pages 68–69.)







Chart 1.20. Stephen Hawking School, Tower Hamlets, London, United Kingdom

*Provision for students with severe learning difficulties.* This primary school serves 75 students with severe learning difficulties. Completed in 1996, the single-storey building includes a nursery, gymnasium, hall, hydrotherapy pool and medical rooms, kitchen and dining room, library, and classrooms below a curved roof. It provides a structured literacy programme involving whole class, small group and individual work.

## Designing inclusive schools for students with special educational needs

*All existing and future design should cater for students with special needs, but designers also need to consider special schools for those children who require greater care.* (Pauline Nee, presenter)

The objective of "inclusive design" is to make schools more accessible to the communities they serve. For students with special educational needs – those with moderate or profound intellectual or physical disabilities, sensory impairments, learning difficulties, or multiple disabilities – this concept is essential to ensure equal access to educational facilities and services.

Chart 1.21. Mossbrook Special School, Sheffield, United Kingdom

*Designing for students with sensory disabilities.* Many students in this primary school, which has a high proportion of children with severe disabilities and autism, are visual learners. The environment has therefore been developed to encourage experiential and sensory learning. The building is situated next to a pond that has been developed as a conservation area and nature reserve. It contains three learning resource rooms, an external deck overlooking the pond and a vertical green "living" wall for growing plants and flowers. The site, a "Classrooms of the Future" project, is intended to attract animals and other wildlife. The new classroom will be a resource for pupils from schools throughout the Sheffield area. (See also pages 54-55.)







Chart 1.22. Library and school hall, Millennium Primary School, Greenwich, United Kingdom

*Providing integrated services for the community.* This school, grouped around a pedestrian piazza serving the new community next to the Millennium Dome, was conceived as a new kind of facility that links education, health care and community on one site. All facilities are open for community use after school hours and on weekends. A primary school, with an early learning centre, is fully inclusive for children with special educational needs and also serves as an adult education and training centre. The health centre provides a range of primary care and family support services for the school and community. The school hall serves as the village hall, and the surrounding playground areas can be used for recreational activities, exhibitions and meetings for the community. (See also pages 94–95.)

## Designing schools with integrated services

*Schools should also include facilities for support agencies so that the school is a natural focus for the surrounding area.* (Mukund Patel, presenter)

The function of educational facilities is extending beyond that of a learning institution. Increasingly, educational facilities are housing a range of non-educational services – healthcare, childcare, and family and other support services – that are available to students, teachers and community members throughout the year.

Chart 1.23. Autistic Spectrum Disorder Resource Base and Community Centre, Netley Primary School, Camden, United Kingdom

*Facilities integrating marginalised groups into the community.* This small building, completed in 2004, is Camden's first specialist unit dedicated to educating autistic primary school children. The Autistic Spectrum Disorder Resource Base can accommodate 16 children for gradual integration into the mainstream curriculum of Netley Primary School, which is located on the same campus. The building also serves as a community centre with a small crèche. It provides IT instruction and literacy classes to adults, especially young mothers and the local immigrant community. The site was previously occupied by a disused school-keeper's house and an old playground shelter.







Chart 1.24. Atrium, Royal Docks Community School, Newham, United Kingdom

*Radial layout increases access.* Inclusive education was a fundamental element in the design brief of this refurbished secondary school. To best respond to this need, a radial layout was designed with a central ramp that encourages all users to share the same route between floors. The ramp thus provides the focal point of the school, enclosing a multi-purpose space. The school is used by the whole community throughout the week, including evenings. Special accommodation is provided for vocational training. Each wing of the school can be closed off when required, allowing the community to use parts of the building without reducing security. (See also pages 96–97.)

## Designing schools to facilitate intra-school integration

*How can school buildings contribute more to the school as a learning community?* (Andrew Bunting, presenter)

School design can build a sense of school community. Design should facilitate the integration of students within the school grounds, providing an accessible, non-threatening learning space for a student population with a diverse range of abilities, and social and cultural backgrounds.

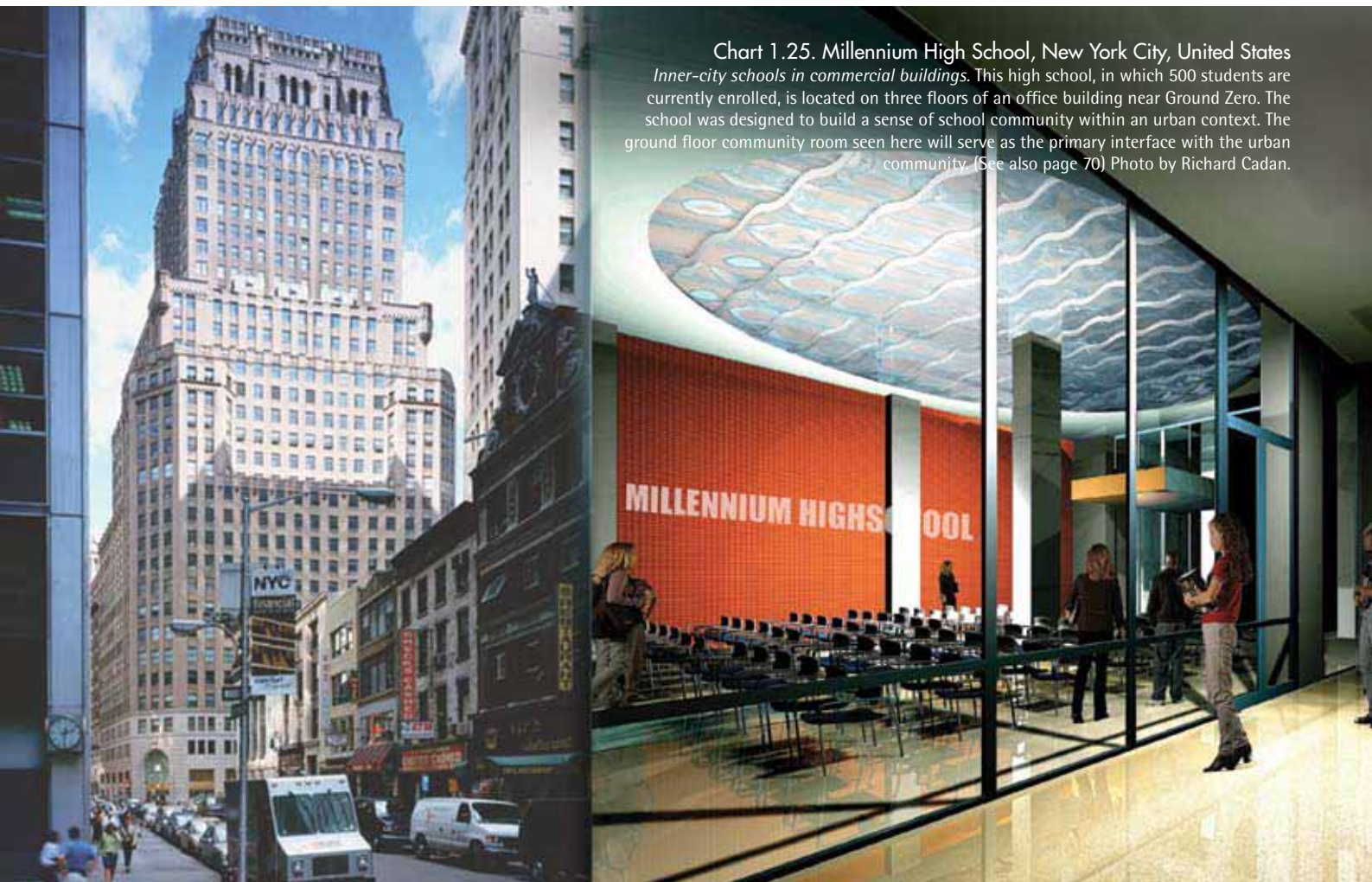


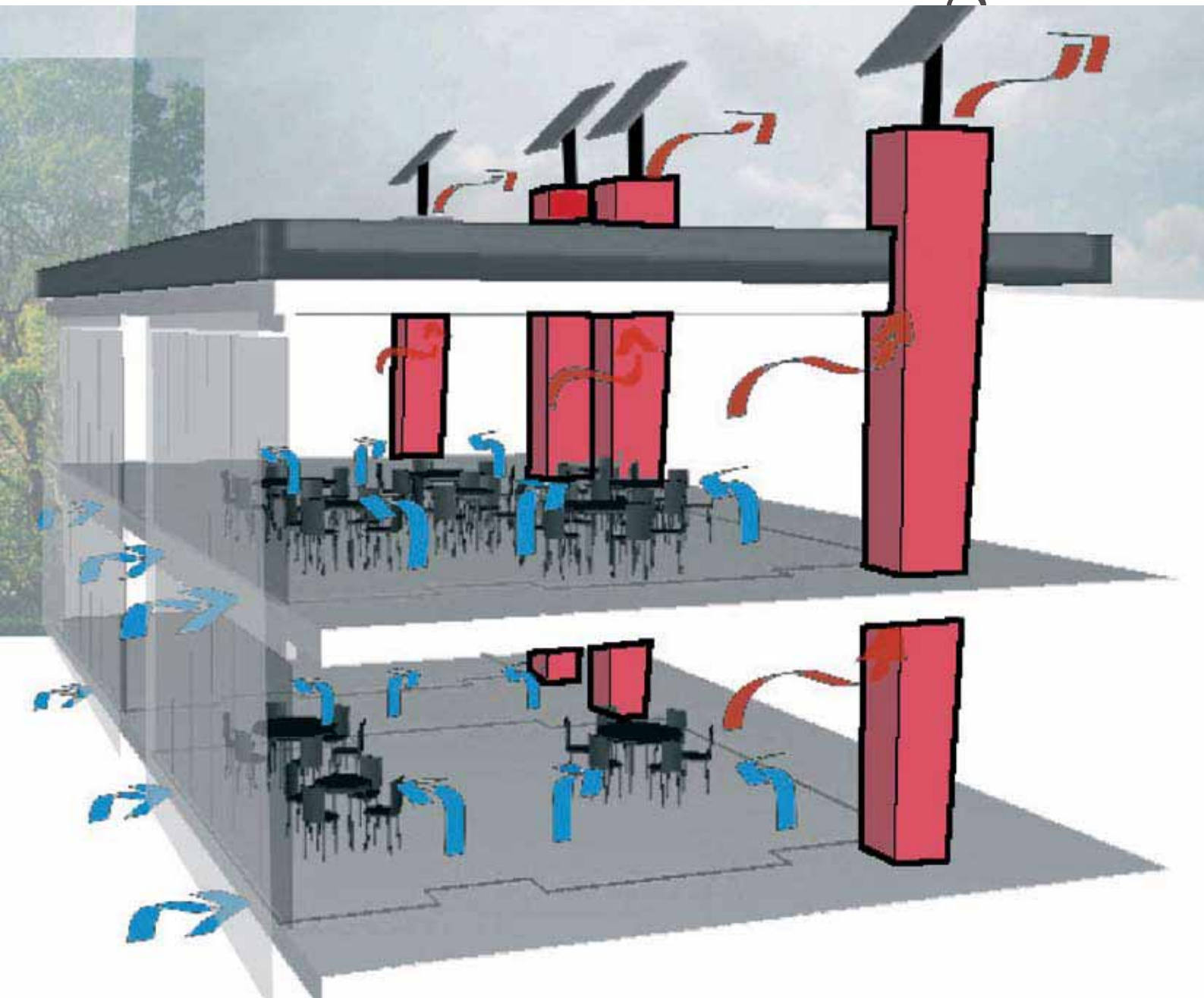
Chart 1.25. Millennium High School, New York City, United States

*Inner-city schools in commercial buildings.* This high school, in which 500 students are currently enrolled, is located on three floors of an office building near Ground Zero. The school was designed to build a sense of school community within an urban context. The ground floor community room seen here will serve as the primary interface with the urban community. (See also page 70) Photo by Richard Cadan.

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## Theme 4. Designing sustainable, comfortable school buildings



As global concerns about the pressures on the earth's finite resources increase, designers are responding in new and innovative ways by creating environmentally sustainable, comfortable learning environments with good ventilation and natural daylight, good acoustics, and low energy use, and by using sustainable materials. The designs presented in this theme highlight the following issues:

- How can sustainable design maximise comfort for both teachers and students?
- How important are natural daylight and ventilation in the design of future educational facilities?
- How can sustainable materials and features be most effectively incorporated into the design of educational facilities?
- How can sustainable design be used as a learning tool for teachers and students?



Chart 1.26. Ringwood Secondary College, Victoria, Australia

*Transforming staff spaces.* Well-designed, comfortable teacher workspaces can increase teacher effectiveness in the planning and preparation of lessons, and enhance communication among teachers. These images show the transformation of the staff area at Ringwood College, which is shared by more than 50 teachers, allowing more efficient use of space, resources and teachers' time.

## Designing comfortable learning spaces

*Sitting inside a classroom on plastic chairs all day is not very conducive to learning. Why can't we sit outside with our laptops when the weather is nice?* (Deepti Nair, student)

One of the objectives of sustainable design is to improve consumer comfort while minimising the building's adverse environmental impact. In schools of the future, students, teachers and designers will be turning to concepts of sustainable design to address comfort-related issues such as hygiene, safety, security, acoustics, and availability of space, natural daylight and natural ventilation.

Chart 1.27. Victoria School, Singapore

*Enjoying learning outdoors.* At this secondary school, teachers draw up lesson plans using outdoor spaces as classrooms for a variety of subjects, including literature. Both students and teachers have been responding positively to the informal setting, which is providing a stimulus for lessons and encouraging students to become less inhibited and more expressive. (See also pages 76-77.)







Chart 1.28. Witheridge Church of England Primary School, Devon, United Kingdom  
*Optimising daylighting in a new sustainable classroom.* This new classroom (right), constructed as part of the "Classrooms of the Future" project, is designed to ensure optimal daylighting. The external teaching zone will provide a protected space that also acts as a canopy to provide glare-free illumination and maximum passive solar collection, ensuring close to zero comfort energy. Simplicity in form and construction will ensure that replication will be uncomplicated. (See also pages 54–55.)

## Maximising natural daylight and ventilation in school design

*Natural daylight is important for students to feel comfortable and ready to learn.* (Deepti Nair, student)

Quality indoor environments can result in health and productivity gains for all users of the building: students, teaching and non-teaching staff, and the community. Designers and their clients can work together to provide optimal learning environments that mitigate the negative effects of inadequate lighting, lack of daylighting and poor air quality.

Chart 1.29. The Business Academy, Bexley, United Kingdom

*Maximising natural daylighting using glazing.* The external walls of this school are curtain glazed to allow natural daylight to penetrate deep into the building. A double-layer façade and external shading louvers reduce heat loss in winter and maximise heat gain in summer. Louvers track the sun's path to provide optimum conditions within the building and minimise energy use. (See also pages 82–83.)







Chart 1.30. Play area and pond, Millennium Primary School, Greenwich, United Kingdom  
*Using sustainable materials for landscaping.* At this school, play areas have coloured patterns with structures to provide shade. The surrounding landscape was created from recycled material, the forms, colours and texture of which vary according to the season. A number of ecological trails demonstrate different habitats. (See also pages 94–95.)

## Incorporating sustainable materials and features into school design

*It is important that sustainable ideas such as recycling rainwater can be understood by and demonstrated to the students.* (Pauline Nee, presenter)

The environmental impact of a building throughout its life-cycle is significant, due to material and energy consumption and the resulting pollution and waste, and inefficient or outdated operations and management systems. Increasing concern about these issues has led to the incorporation of sustainable design features in many schools, from the use of renewable, recycled and recyclable materials, low impact construction techniques, and passive heating; to the installation of renewable energy technologies, and efficient water and sewage management systems.



Chart 1.31. National University of Singapore High School of Mathematics and Science, Singapore

*Learning about sustainable schools.* "The Habitat", one of many ideas explored in the design process, portrays the school as a three-dimensional learning tool. The idea behind The Habitat is that students can monitor the energy and water consumption of their school building by exploring the building's exposed air-conditioner ducts, light fixtures, sunshades and louver systems, and a feature wall showcasing a network of pipes, cables and ducts. Electricity and water metres, available in some classrooms, laboratories and toilets, demonstrate energy consumption. (See also pages 76-77.)



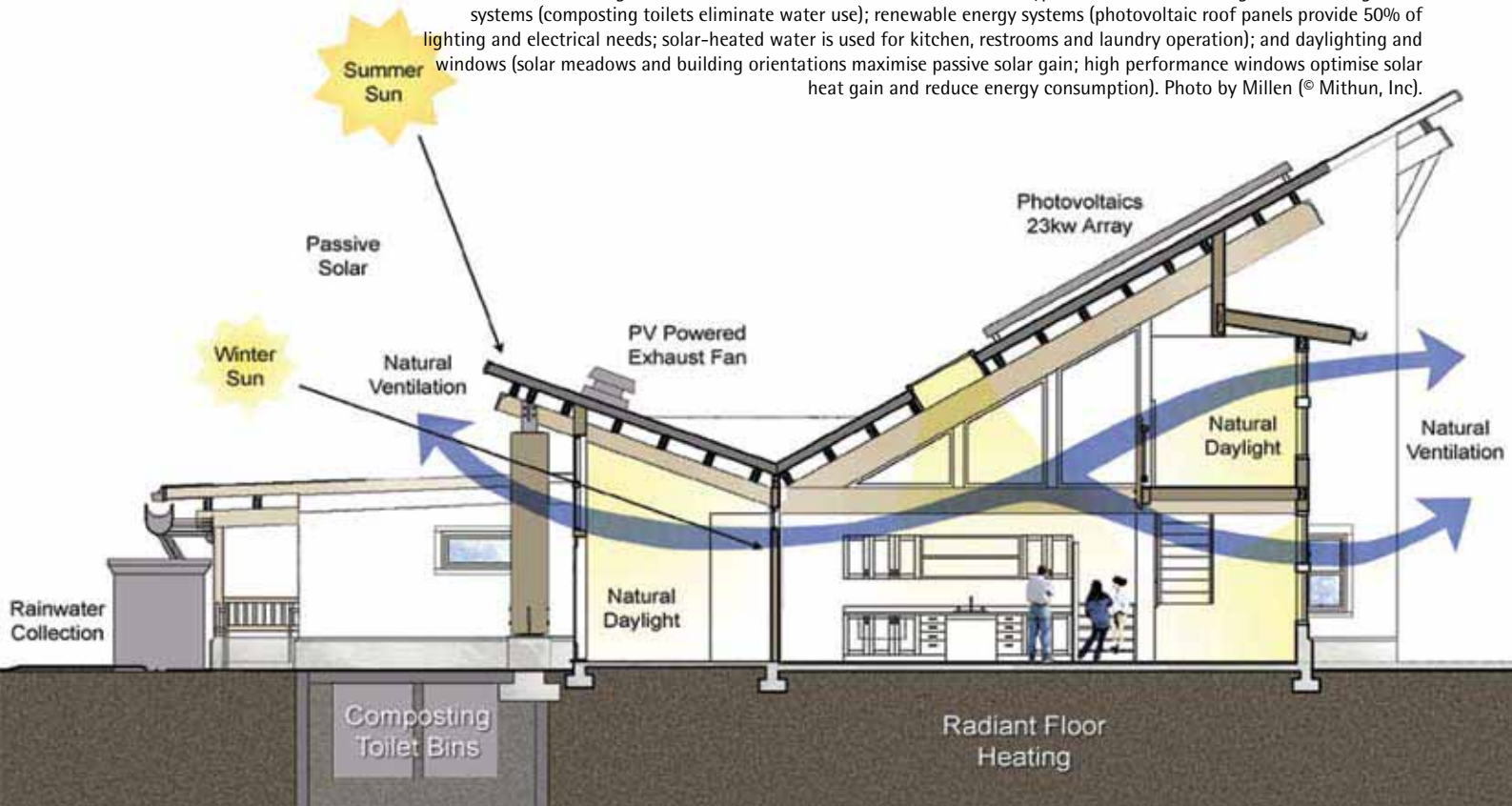
## Using sustainable design as a learning tool

*Even small-scale elements, such as fitted gauges and energy counters, can demonstrate environmental sustainability to students.* (Pit Li Phan, presenter)

Individual features of a school building and even the building as a whole can be used to demonstrate how facilities interact with and affect the environment. By using the educational facility as a learning tool, students can actively engage in monitoring the performance and consumption of their own learning environment, thus raising their awareness of and capacity to care for the environment.

Chart 1.32. IslandWood, Bainbridge Island, Washington State, United States

*Learning about sustainable design.* This education centre, which opened in 2002, is committed to energy conservation, composting, recycling and harnessing alternative energy sources. All campus facilities contain numerous sustainable elements: water conservation (rainwater is collected at several buildings for use in landscape irrigation); recycling (flooring is assembled from salvaged wood and each classroom features a different type of sustainable flooring); waste management systems (composting toilets eliminate water use); renewable energy systems (photovoltaic roof panels provide 50% of lighting and electrical needs; solar-heated water is used for kitchen, restrooms and laundry operation); and daylighting and windows (solar meadows and building orientations maximise passive solar gain; high performance windows optimise solar heat gain and reduce energy consumption). Photo by Millen (© Mithun, Inc).



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## Theme 5. Involving all stakeholders in the design process



The involvement of stakeholders in the design brief and other phases not only serves to improve the design quality of the school, it also creates a sense of shared ownership and identity amongst the principal users of the facility: the school community. Existing case studies, national projects and methodologies such as postoccupancy evaluation demonstrate the benefits of involving multiple stakeholders from both public and private sectors – students, educators, the community, planners and designers – in decisions regarding the design, planning and management of educational spaces. The designs presented in this theme highlight the following issues:

- How can future designers harness students' creativity as input into the design process?
- How can designers most effectively engage teachers in the design process?
- How can students and the local community participate in the design process?
- How can partnerships between the public and the private sectors enhance the design process?





**Chart 1.33. Grey Court Community School (Secondary), Richmond upon Thames, United Kingdom**

*Designing with students' creativity.* This classroom, which has been installed in two schools in Richmond Upon Thames as part of the "Classrooms of the Future" project, was built according to students' ideas of an exciting classroom environment. Two stand-alone classrooms were constructed – one in a secondary school (seen here) and one in a primary school – in Ham, a mixed area including a large estate with high levels of deprivation, juxtaposed with more affluent housing. The classrooms are designed to challenge the traditional roles of teacher and learner, and to encourage creativity. Internal space extends out onto a terrace, which can be used for individual or group study and for performance. Circular roof lights and acoustic panels are integrated into the ceiling. (See also pages 54–55.)

## Using students' creativity

*We need to harness children's own creativity to build child-centred schools.* (Stephen Heppell, presenter)

Student engagement is an important condition for learning. Designers can best engage and respond to students' needs by listening to them, inspiring them and exposing them to new and diverse concepts and experiences. Involving students in the design phase will result in facilities that reflect their needs, desires and creative ideas. If the project is completed quickly or in short phases, students can also see their ideas come to fruition, resulting in a greater feeling of ownership.

**Chart 1.34. Hythe Community Infants School, Kent, United Kingdom**

*Creating a creative space with and for young students.* All 185 students, aged between four and seven years, were involved in the planning of this new space as part of the "joinedupdesignforschools" project. Students communicated their ideas through drawings, paintings, models and collages, prompting architects from Ben Kelly Design to transform the space into an art gallery that celebrates the children's creativity using an innovative artwork display system. Other features suggested by the children, including child-friendly chairs with a place for sweets, yellow beach bucket lights and a pink floor, were incorporated into the design. (See also pages 78–79.)

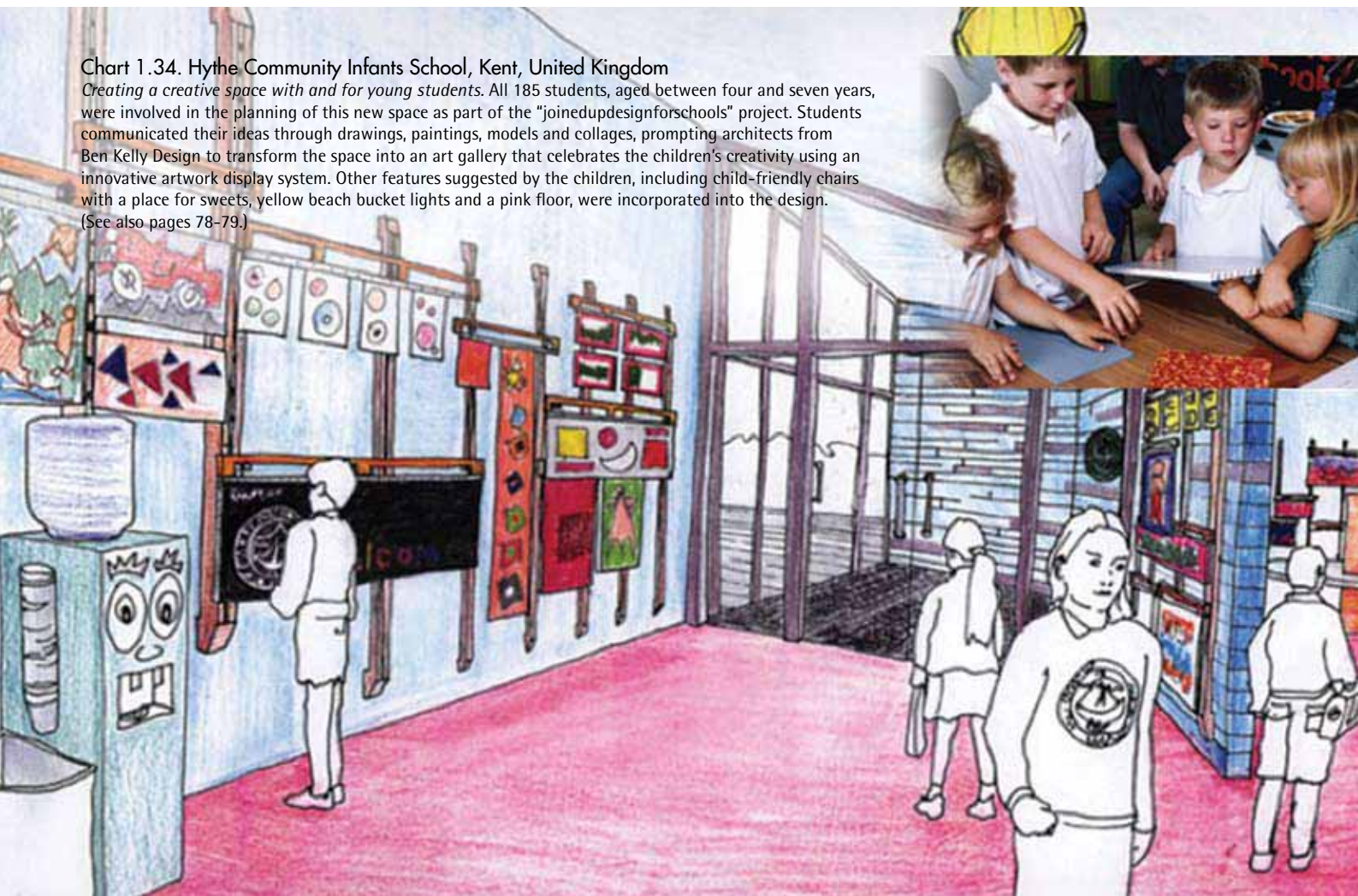






Chart 1.35. Kings Avenue Primary School, Lambeth, United Kingdom

Teachers and designers at this primary school, which provides facilities for children with visual impairments, incorporated students' ideas into the project using classroom-based workshops. Students selected the colour scheme of the school and helped design play areas, and the design team worked closely with the new head and governors, explaining the proposals to parents before the school was temporarily relocated to a nearby site. The renovated school, which includes eight new classrooms and new outdoor areas, has a vibrant, light and colourful character. (See also pages 88-89.)

## Engaging teachers in school design

*It was necessary to inspire these teachers by showing them stimulating environments outside the school world such as offices, factories, entertainment facilities and retail outlets. (John Sorrell, presenter)*

As the educational process becomes more learner-centred and technology-driven, teachers must learn to use new and more flexible learning environments to the best effect. Outside the classroom, teachers require suitable accommodation for such activities as lesson preparation, staff meetings and professional development. Teachers should therefore engage with students, designers and others to help shape future learning environments and to create comfortable, effective staff spaces outside the classroom.





Chart 1.36. Reece High School, Devonport, Tasmania, Australia

*Canvassing community commitment to rebuilding a school.* Reece High School was destroyed by arson on 5 December 2000. The redesigned school, which was completed with a modest budget two years after the fire, is an example of how a successful 21<sup>st</sup> century learning environment can be created through the combined efforts of the planning and architectural team, parents, staff, state government officials, local school personnel, business owners and civic/cultural organisations.

Reece High School is committed to its community and to realising each individual's potential through creativity, enterprise, communication and teamwork. It received the James D. MacConnell Award by the Council of Educational Facility Planners International (CEFPI) in 2003.

## Engaging communities in school design

*Different stakeholders have different views of reality. All perspectives should to be taken into account when judging the success of a design.* (John Jenkins, presenter)

Educational facilities are a focal point for many communities. In response, schools must be designed to benefit the communities they serve, allowing for the integration of facilities and services during and after the school day. By becoming involved in the design process and in other areas such as school maintenance and management, communities can have a significant and sustained impact on the physical learning environment.



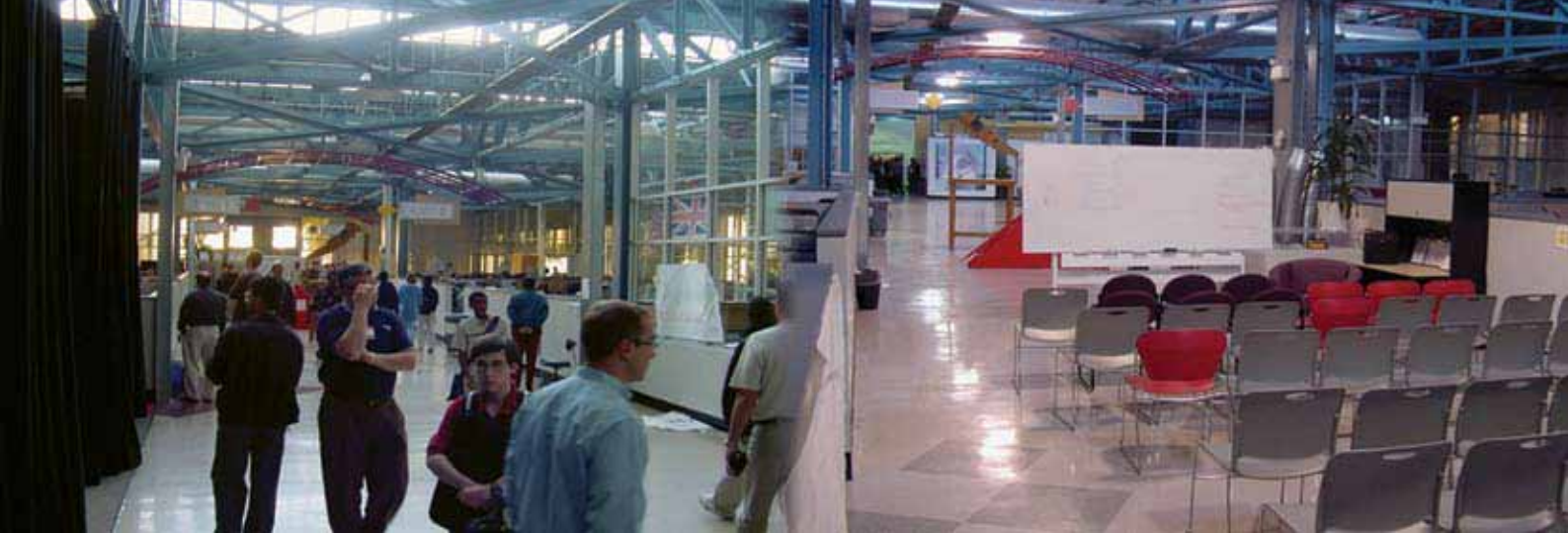


Chart 1.37. High Tech High School, San Diego, United States

*Forging successful public-private partnerships.* This small school, completed in 2000, represents a successful model of collaboration between education practitioners and business leaders. The school is founded on three design principles: personalisation, adult world connection and a common intellectual mission. It contains animation laboratories, state-of-the-art biochemistry and engineering laboratories, and flexible classroom space, all connected to an advanced electronic infrastructure.

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## Forging public and private partnerships in school design

*A completed building can compromise the teaching and learning process if all stakeholders are not committed to the decisions taken throughout the design process.* (Mukund Patel, presenter)

In many countries, Public Private Partnership is an effective means by which the public and private sectors can work together to deliver new or improved educational facilities and services. In many partnership arrangements, schools commit part of their budgets over the life of the contract, and in return are provided with a specific level of services. To ensure success, all partners – including teachers and school administrators – must work together to define roles and responsibilities concerning the financing and management of educational facilities and services.

Chart 1.38. Waverley Sports College, Southwark, United Kingdom

*Promoting women in the construction industry.* Prior to the construction of the two-storey steel-frame school building in November 2002, a workshop was organised for all stakeholders to identify concerns and issues, develop responses and solutions, and promote collaborative working. During construction, special seminars were held for students to promote careers for women in construction. To involve students, the construction company set up cameras monitoring day-to-day developments to show on a dynamic interactive Web site to be launched for the school. In 2004, Waverley became a specialist sports college, one of four all-girls sports colleges in England. (See also pages 72–73.)



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## Theme 6. Educational facilities as a learning tool



School buildings and their surroundings are a useful resource for teaching and for fostering independent, enquiry-based learning. Building designers can use the architectural elements, the building systems and the external spaces to provide many different learning opportunities for students in new and existing schools. The designs presented in this theme highlight two broad issues:

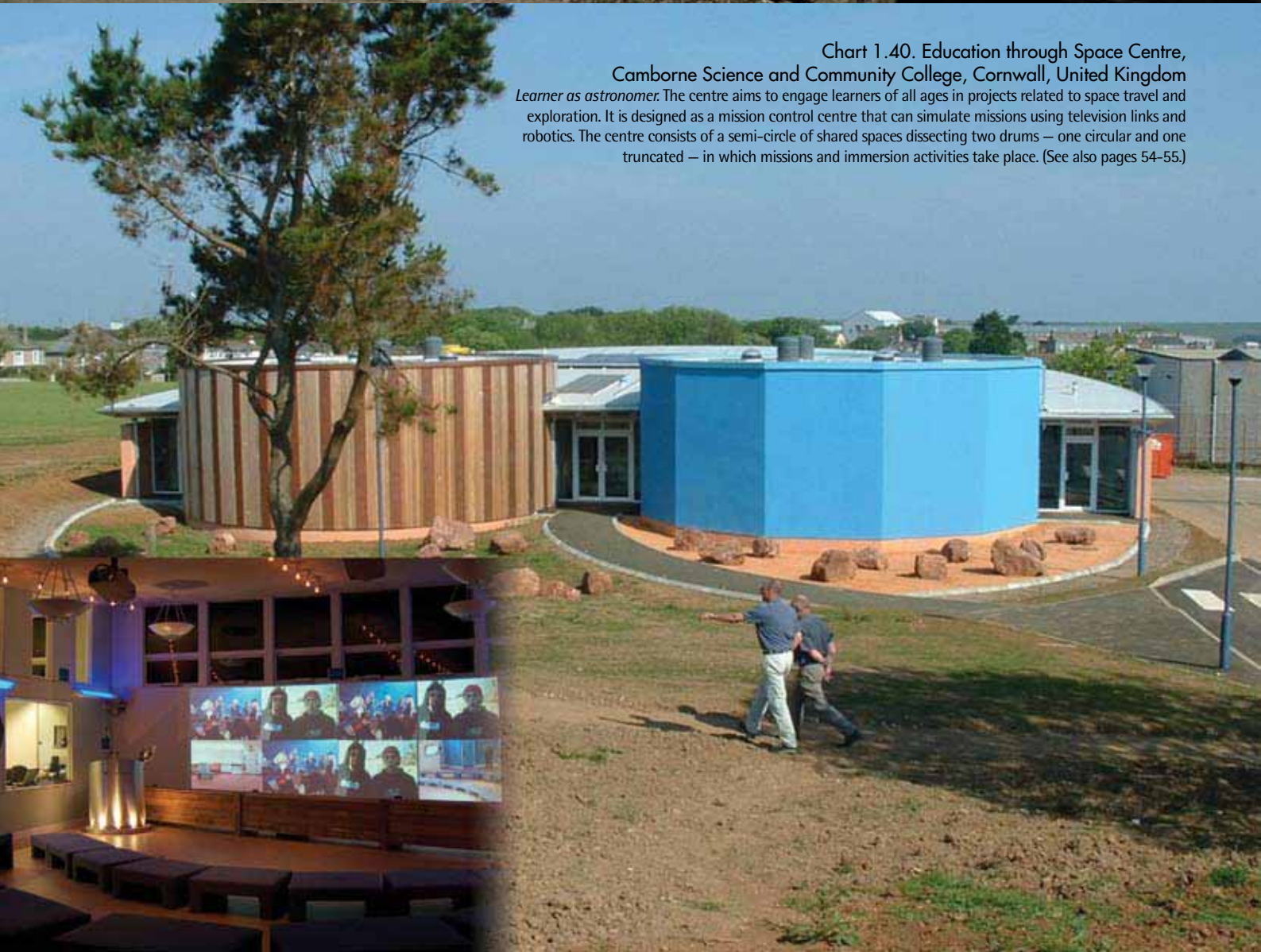
- How can educational facilities of the future be constructed as learning systems?
- Which individual architectural features can be incorporated into educational facilities of the future?





**Chart 1.39. St. Francis of Assisi Catholic Primary School, Kensington and Chelsea, United Kingdom**

*Learner as scientist.* This building, which is a "Classrooms of the Future" initiative, is a pedagogical tool in itself. It contains a building management system that enables learners to monitor the health and efficiency of their learning environment. Facilities include a class base for 30 students, a mini-biosphere and a domed observatory with a high-powered remote-controlled telescope. Additional learning zones devoted to subjects such as astronomy, virtual reality and science will be available to learners from all over the borough of Kensington and Chelsea. (See also pages 54-55 and 98-99.)



**Chart 1.40. Education through Space Centre, Camborne Science and Community College, Cornwall, United Kingdom**

*Learner as astronomer.* The centre aims to engage learners of all ages in projects related to space travel and exploration. It is designed as a mission control centre that can simulate missions using television links and robotics. The centre consists of a semi-circle of shared spaces dissecting two drums — one circular and one truncated — in which missions and immersion activities take place. (See also pages 54-55.)



## Building systems as learning tools

*Learning opportunities can be built into a school using the building as a three-dimensional tool. (Pit Li Phan, presenter)*

Future learning environments must not only respond to changes in the organisation of learning; they must become learning entities unto themselves, challenging traditional perceptions about the appearance and function of school buildings. In some countries, designers and the school community are transforming the internal and external school environment to create a new, innovative education tool, transporting both teacher and student to another learning dimension.



Chart 1.41. Henry Park Primary School, Singapore

*Learner as ecologist.* One of the key ideas for this new school was to transform the green area into a "Green Trail" of thematic gardens aimed at teaching students about the local flora and fauna. Specialised outdoor learning areas — a water habitat, fern garden, cacti corner and butterfly garden — provide a rich, hands-on resource for teaching and learning. (See also pages 76–77.)





Chart 1.42. National University of Singapore High School of Mathematics and Science, Singapore  
*Learner as chemist.* The idea of a school as a three-dimensional learning tool was incorporated into the design of this school for students gifted in mathematics and science. Many concepts were explored in the design of the school's icon, such as the dynamic form of a double helix representing the structure of DNA, eventually taking the form of a nano tube stairway at the entry lobby. The main facade of the auditorium was designed as an abstract version of the periodic table, with different parts of the elevation relating to different groups of elements. The "Pi Wall" defines the edge of the main concourse facing the track and field. It is derived from the mathematical concept of Pi, and consists of a mosaic of rectangular perforated aluminium panels that are translated into the decimal digits of Pi through a number-coded colour system. The curvature relates to a central point within the campus, and the balustrade spacing is based on a specific degree in relation to the total circumference. (See also pages 76-77.) Photo by CPG Consultants Pte Ltd.

## Architectural elements as a learning tool

*The shape, size and pattern of windows can demonstrate music, the pattern of light fittings can illustrate star constellations, and staircases can act as a sundial or a play structure.* (Pit Li Phan, presenter)

For many students, "learning by doing" is more effective and motivating than other methods of learning. Designers can incorporate learning features from core subjects, such as mathematics, science, the arts and physical education, and concepts such as environmental sustainability in both new and existing schools to foster more experiential forms of learning. Teachers can use these elements from the internal or external environment to enhance and complement the curriculum.





Chart 1.43. National University of Singapore High School of Mathematics and Science, Singapore  
*Learner as botanist.* On the Eco-Learning Trail, students can learn about species and characteristics of flora and fauna, natural habitats, natural processes such as respiration, and the interdependence of ecosystems. The trail meanders through courtyards between teaching blocks, along the main concourse. This concourse provides a good vantage point from which visitors can view a small fountain called The Source, and various water habitats and eco gardens. The aquatic and eco systems, flora and fauna provide students with real life examples, enriching their total learning experience. (See also pages 76-77.)



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## Theme 7. Assuring design quality



Quality design can inspire students to learn and teachers to teach, and can have a positive effect on the local community and environment. But it is difficult to achieve general consensus on what constitutes design quality and how it can be measured. Furthermore, there is little agreement on the nature of the relationship between quality educational facilities and educational outcome measures. The designs presented in this theme highlight four issues:

- How can design quality be defined as it relates to educational facilities?
- How does design quality translate into educational outcomes?
- Can we measure design quality?
- How can analysis of best design practice raise the quality of educational facilities?



## Defining quality in educational facilities

*What is design quality? Can we ever agree?* (John Jenkins, presenter)

Quality of design can be measured by a school building's fitness for purpose, sustainability, accessibility, flexibility, inspiration, comfort and safety. But quality can be interpreted differently by different stakeholders at different points in the design process. Establishing a general quality model that reflects the views of all stakeholders is necessary to evaluate the effectiveness of the educational facility.

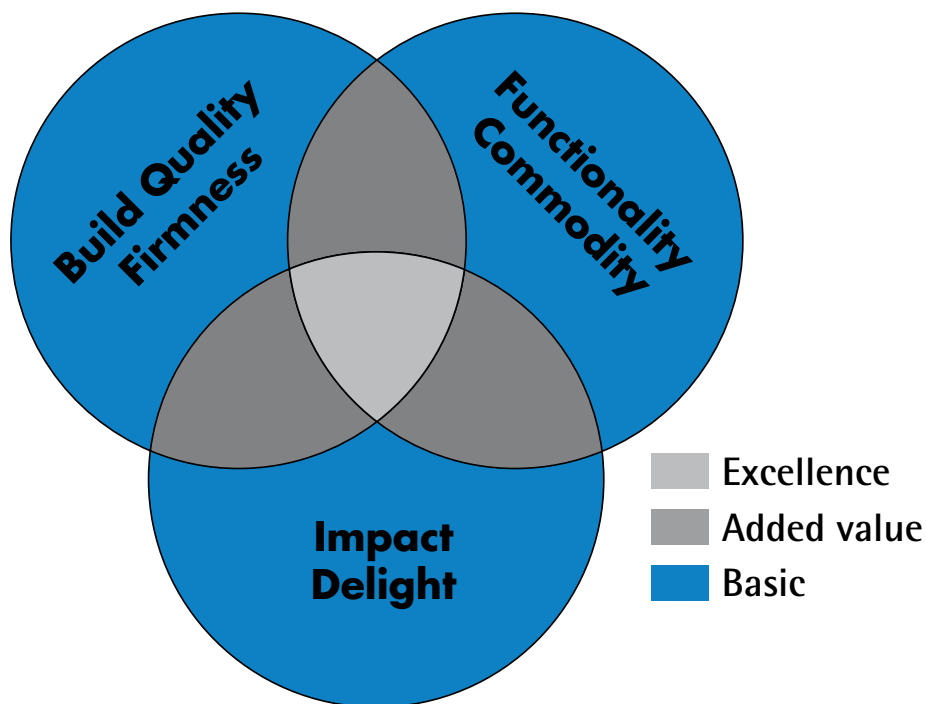


Chart 1.44. Principles of quality, Design Quality Indicator, United Kingdom

*Creating a model for design quality.* This model was used as the basis for the Design Quality Indicator (DQI) tool. It is based on the principles of firmness (*i.e.* build quality, or the performance of a building fabric), commodity (*i.e.* functionality of the design, or its use, access and space) and delight (*i.e.* impact, or the building's ability to create a sense of place, and to have a positive effect on the local community and environment). (See also pages 66–67.)



Chart 1.45. Kingsdale Secondary School, Southwark, United Kingdom

*Improving academic performance through improved design.* Historically regarded as a poorly achieving school, this "School Works" project was conceived to better understand the effects of the school building on students and the community in an effort to raise students' attainment levels. The school community worked with a group of architects and educationalists through a series of well-attended workshops to identify how it wanted to improve the school buildings. Since the completion of the project, academic performance, behaviour and morale have improved, and vandalism and staff turnover has reduced. (See also pages 90-91.)

## Improving educational performance through design quality

*It is a pity that there is no measure of how much learning has leaked out of a poorly designed school.*  
(Stephen Heppell, presenter)

How does quality design raise educational standards and improve student performance? A number of innovative design projects, in which facilities have been upgraded or renovated, have served to stimulate and motivate students and increase student achievement. Existing research, however, sheds little light on the nature or strength of the relationship between the quality of school facilities and educational outcomes, which is often measured by the performance of students on standardised tests.



it

DQI Online - DQI Questionnaire - Microsoft Internet Explorer

Functionality Build Quality **Impact** Weightings Likes & Dislikes

Impact includes a building's ability to delight, to intrigue, to create a sense of place, and uplift the local community and environment. Also the design's contribution to the arts and science of building and architecture.

**Character & Innovation**  
Character and Innovation is concerned with what people think of the overall building.

1 The building will provide a sense of security

2 The building will lift the spirits

3 Visitors will like to come here

4 The building will reinforce the image of the occupier's organisation

5 The building is likely to be widely acclaimed for its quality

6 The building will have character

7 The building will make you think

8 There has been a clear vision behind the building

9 The building's design and construction is likely to contribute to development of new knowledge

Strongly Disagree Disagree Tend to Disagree Tend to Agree Agree Strongly Agree Not Applicable Don't Know

Take a Break Submit Questionnaire Previous Section Next Section

**DQI ONLINE QUESTIONNAIRE**

Introduction

Functionality

Use

Access

Space

Summary

Build Quality

Performance

Engineering

Construction

Summary

Impact

Character & Innovation

Form & Materials

Internal Environment

Urban & Social Integration

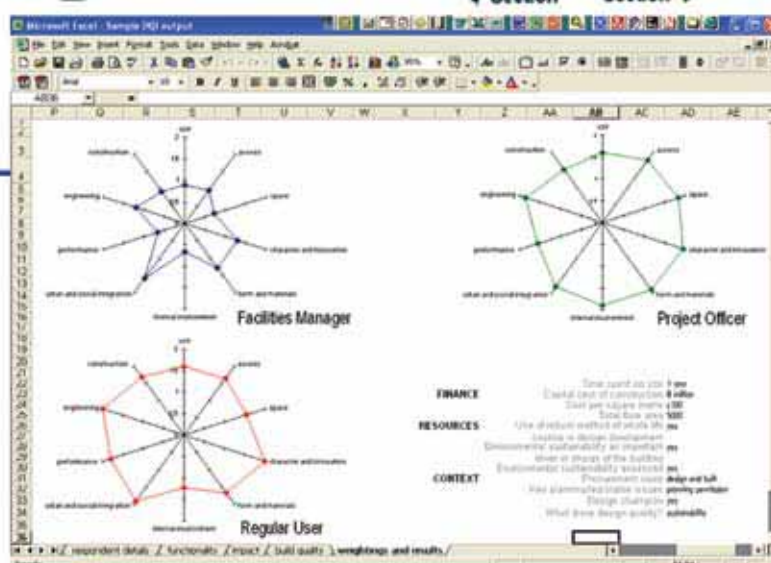
Summary

Weightings

Likes and Dislikes

Chart 1.46. Design Quality Indicator tool

Assessing design quality. Design Quality Indicator (DQI) is an online evaluation tool developed by the Construction Industry Council in the United Kingdom to evaluate design quality. The tool is a simple, non-technical questionnaire, which is completed by various stakeholders at different stages in the design process. Responses are fed into a computer model, which generates a spider diagram representing the different stakeholders' views of the main design factors. (See also pages 66-67.)



## Measuring quality in educational facilities

*Canvassing the views of every stakeholder, based on his or her responsibilities, experiences and preconception, gives a better measure of success than any individual appraisal.* (John Jenkins, presenter)

How and by whom is the success of a building judged? Using the principles of quality in educational facilities identified in quality models, an increasing number of qualitative and quantitative methodologies are being developed to explore the degree to which buildings support the goals of the educational process. Research tools such as questionnaires, interviews, observation, walkthroughs and focus groups have been used to evaluate the effectiveness of the design from the users' and other stakeholders' perspectives, with a view to establishing best practice guidelines.



Chart 1.47. Building Schools for the Future, United Kingdom

*Showcasing exemplar designs.* Local Education Authorities entering the "Building Schools for the Future" competition, a Department for Education and Skills, United Kingdom project showcasing exemplar designs, were judged on the basis of design concepts and ideas that capture the "spirit of our age". The exemplar designs were published in a booklet for dissemination to a wide audience. (See also pages 74-75.)

## Identifying best practice

*Exemplar designs should demonstrate inspired design, but they are only good ideas and not prescriptive.*  
(Stephen Crowne, presenter)

In many countries, there is a wealth of examples of effective design principles and practice. Case studies of remodelled, newly constructed and renovated facilities that "work" in practice can create benchmarks for well-designed schools.



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## SECTION II

### SUMMARY OF PRESENTATIONS



*Good facilities do more than teach, they inspire. They aspire to shape minds, both inside and beyond the classroom. (Pit Li Phan, presenter)*



## "Classrooms of the Future" project, United Kingdom

## Key points

- In 2001, the children's manifesto was drawn up from responses to an essay competition on the "School I'd Like" from more than 15 000 primary and secondary students in the United Kingdom. Students identified their desire for a beautiful, comfortable, safe school without walls, with drinking water in every classroom, clean toilets that lock, large lockers and a swimming pool (Chart 2.1). Many of the ideas expressed in the manifesto are reflected in the "Classrooms of the Future" designs.
- The objectives of "Classrooms of the Future" are to identify the drivers of change in school building design, and to test innovative design ideas in advance of a significant increase in capital investment in educational facilities. All Local Education Authorities (LEAs) in the United Kingdom were invited to compete for funding. Twelve LEAs and 30 schools were selected.
- Eight drivers of change in school building design were identified during the study: developments in education, changes in the organisation of the classroom environment, developments in ICT, inclusion, increasing community use of school buildings, the need for flexible and adaptable school buildings, development in building technologies, and issues of sustainability.



Chart 2.2. Wrockwardine Wood Church of England Junior School, Telford and Wrekin, United Kingdom

*Creating sustainable relocatable classrooms.* The aim of school projects completed in Telford and Wrekin is to build classrooms that are removable, transportable and replicable for future use. Projects are completed off site to improve quality, reduce construction time and minimise on-site accidents. At Wrockwardine Wood, photovoltaic cells and solar panels have been incorporated into the roof design to reduce energy consumption.

**Chart 2.2. Wrockwardine Wood Church of England Junior School, Telford and Wrekin, United Kingdom**  
*Creating sustainable relocatable classrooms.* The aim of school projects completed in Telford and Wrekin is to build classrooms that are removable, transportable and replicable for future use. Projects are completed off site to improve quality, reduce construction time and minimise on-site accidents. At Wrockwardine Wood, photovoltaic cells and solar panels have been incorporated into the roof design to reduce energy consumption.





**Chart 2.3. Ballifield Community Primary School, Sheffield, United Kingdom**  
*Combining nature and technology.* This project involves the addition of two new class bases, separated by a moveable screen, with a new main entrance, cloakroom and toilets. Children and visitors enter the building through a door in a hedge, and the semi-glazed entrance hall continues the forest theme. The spaces are largely timber-clad, with green living walls. The external environment is designed as a backdrop for science and nature lessons

## Key projects

"Classrooms of the Future" projects can be grouped into four main categories:

- Projects involving **prefabricated and relocatable buildings**, such as the Yorkon steel-framed volumetric classroom for Wrockwardine Wood Church of England Junior School in Telford and Wrekin (Chart 2.2), three schools in Richmond upon Thames (see page 36) and the Camden ICT-rich mobile classroom (see page 19).
- Projects that use ICT to link **rural schools**, such as Hobart High School and Thurlton Primary School in Norfolk (see page 19), and Chulmleigh Community College (Chart 2.4), Winkleigh Primary School (see page 15) and Witheridge Church of England Primary School in Devon (see page 31).
- Projects investigating **internal and external spaces** of schools such as Ballifield Community Primary School (Chart 2.3), Mossbrook Special School (see page 25) and Yewlands Secondary School (see page 18) in Sheffield.
- **One-off projects**, such as the Education through Space Centre, Camborne Science and Community College, Cornwall (see page 42) and the class-base observatory at St. Francis of Assisi Catholic Primary School, Kensington and Chelsea (see pages 42 and 98-99).



**Chart 2.4. Chulmleigh Community College, Devon, United Kingdom**  
*Creating open, light learning spaces.* In addition to providing the latest ICT equipment, the timber-frame construction and recycled insulation reduces energy use. The space is illuminated almost entirely by a large roof light oriented to the north to eliminate solar gains and glare associated with conventional school design.



## Jean Bouchard:

# Installing a fibre-optic network and distance learning education technologies in Quebec, Canada

One of the driving forces behind the Quebec fibre-optic network project was a groundswell desire from small, isolated rural communities to save their schools because of the important role the schools play in their lives. (Jean Bouchard, presenter)

### Profile

Jean Bouchard is Director General for Financing and Educational Facilities for pre-school, primary and secondary education at the Ministry of Education, Quebec (*Direction générale du financement et de l'équipement*, DGFE). The role of the DGFE is to draw up triennial plans for educational facilities; administer and monitor investment projects; and allocate and review all annual budgets, taxes and investments concerning educational facilities.

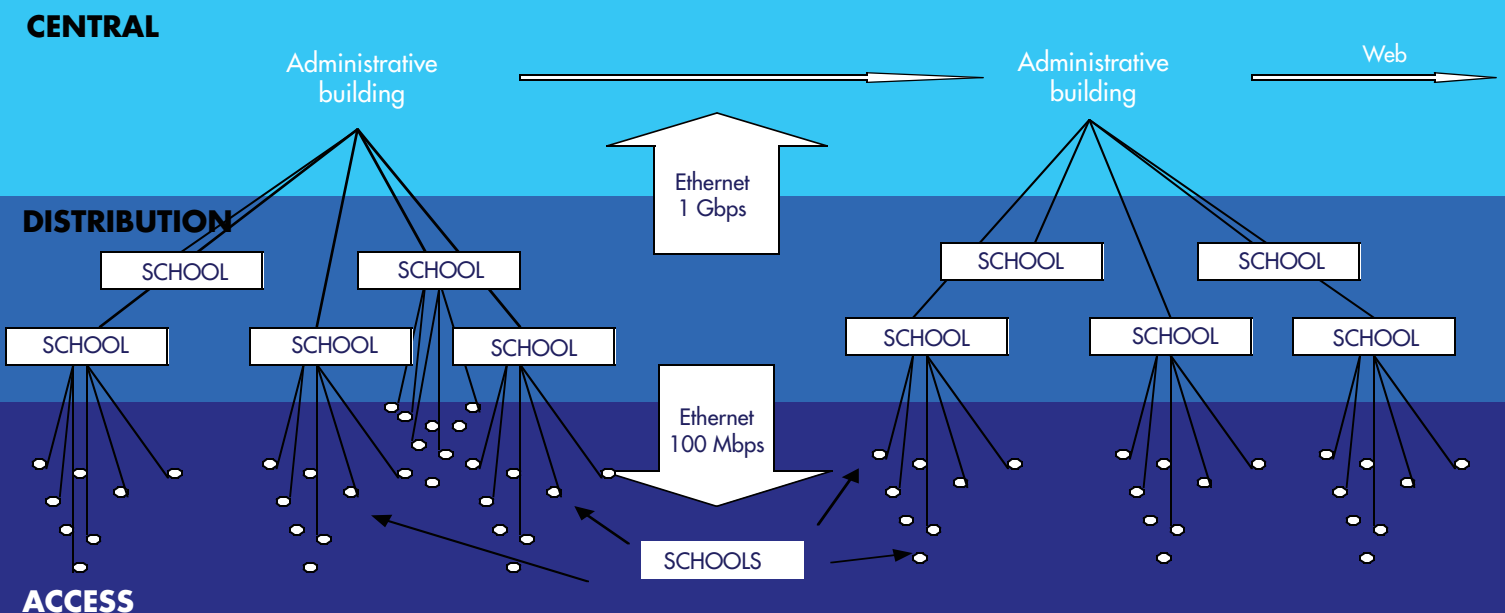


Chart 2.5a. "Connectivity for Quebec's Communities", Quebec, Canada

### Key points

- The Canadian province of Quebec has one of the lowest birth rates in the world. It has also seen large-scale migration of youth from rural communities to urban centres.
- Quebec's rural schools are facing a sharp decline in enrolments, threatening their viability. Sixty-one of its 400 schools have less than 40 students. Local communities and the government are committed to saving their schools.
- The Ministry of Education in Quebec has implemented two support measures to preserve rural schools:
  1. Financial aid to boost the operating budgets of rural schools. Special capital investment subsidies have also been introduced for use by school boards for major renovation work.
  2. Use of ICT through the implementation of a fibre-optic network and a "Remote School Network" project.

Chart 2.6. Diagram of Web architecture for implementing a fibre-optic network, Quebec, Canada.



## Key projects

### Fibre-optic network

- **Aim.** To link Quebec's 3 000 schools, especially small, rural schools, and to create new synergies between schools and communities.
- **Implementation.** Web architecture has three levels: access (i.e. for individual schools to access at a minimum of 100 mbps, Level-2 switches are required), distribution (i.e. for groups of schools, Level-2 and Level-3 switches are required) and central (i.e. for the backbone of the network, Level-3 switches are required).
- **Successes.** In 2001, the government launched the "Connectivity for Quebec's Communities" aid programme, aimed at school boards and municipalities. Full implementation is expected by 2006-07.
- **Challenges.** To engage multiple stakeholders in complex partnerships, from school boards and municipalities to government-regulated telecommunication firms and electric power distribution networks; to develop know-how in the face of limited expertise; and to alter existing regulatory provisions.

### Remote School Network

- **Aim.** To provide up-to-date ICT resources for all students and teachers in participating schools.
- **Implementation.** The pilot activity involves three school boards, three pilot schools and seven partner schools; and 30% of learning activities are delivered via a network with other schools. Each school has broadband access and standard video conferencing equipment; and there is one PC for every five students, a Webcam, microphone, large screen and projector.
- **Successes.** Teachers' pedagogical practices have been transformed; teachers feel less professionally isolated; students are more motivated to learn and stimulated by increased social interaction; and community's perception of schools have been improved.
- **Challenges.** To review the partnership models and technical, financial, security, teacher training and pedagogical implications of the pilot project with a view to expanding the model to other schools.



Chart 2.5b. "Connectivity for Quebec's Communities", Quebec, Canada



Chart 2.7. Remote School Network project, Quebec, Canada



## Andrew Bunting: Designing for purpose – but which purpose?

*A fundamental complexity of school design has always arisen due to the multiple and conflicting purposes for educational institutions. "Form follows function" is not so clear or direct when there are multiple functions that buildings must serve. (Andrew Bunting, presenter)*

### Profile

Andrew Bunting is director of Architectus, Melbourne, an architectural firm comprising more than 160 architects in five cities. Architectus has been involved in the design of several award-winning schools in Australia and New Zealand. It is committed to providing inspirational environments that are conducive to the learning experience, based on the belief that places of learning should be attractive, inspirational and functional for all staff and students.



Chart 2.9. Cooking facilities at the Goulburn Ovens Institute of TAFE, Seymour Campus, Victoria, Australia

*Specialised facilities.* Technical and Further Education (TAFE) colleges are the largest vocational education and training provider in Australia. The Goulburn Ovens Institute of TAFE was officially formed in October 1996 through the amalgamation of the Goulburn Valley and the Wangaratta Institutes of TAFE to assist in the economic development of the Goulburn North East Region of the state of Victoria. The institute offers specialised and customised training programmes for industry and enterprises and low cost education and training to individuals.

looking for economic growth and good citizenship, employers for an educated workforce, and students and parents for individual success.

- A survey on design in secondary schools completed by 23 educators and 23 architects throughout the world revealed a number of common links between the evolving purposes of schooling and school design.

#### 1. Socialisation.

The purpose of *schooling* is to replicate society, to imbue local and national culture, and to promote good citizenship.

The role of *school design* is to address the concept of community within the school, as well as the relationship of the school to the external community, while ensuring school security (Chart 2.8). Specific design features include geographic connection to the hubs of community; traditional or café dining facilities; the house and/or studio model of learning; and informal gathering and learning areas.

#### 2. Vocation.

The purpose of *schooling* is to train students for employment.

The role of *school design* is to create more specialised and vocationally oriented settings for students (Chart 2.9), either within existing schools or as separate facilities while making ample provision for new technologies (Chart 2.10).



Chart 2.8. Malvern Central School, Victoria, Australia

*Conflicting signals: Openness versus security.* While there is an increasing focus by educators and architects on community integration and openness in schools, the physical security features of a school building – weld-mesh fences, locked gates and prohibition signs saying "Keep Out" – often convey a contradictory message.

### Key points

- Different stakeholders carry different expectations concerning the purpose of schooling. Governments are





Chart 2.10. Library, Ipswich Campus, University of Queensland, Australia  
*Relaxing multi-use spaces.* The award-winning building, opened in 2003, houses a library, an "AskIT" service, a student centre, student support services, a cafe, health services, the students' union, the office of the campus manager and the office of the pro-vice chancellor. A garden and stream separates different learning spaces within the library. There are 180 public-access computers in the library, providing access to the Cybrary Web site, e-mail, Internet, networked printing and copying, online course materials and software – Word, Powerpoint, Excel and Access – and the UQ network. Photos by University of Queensland.

### 3. Personal fulfilment.

The purpose of *schooling* is to foster individual growth and understanding.

The role of *school design* is to provide facilities dedicated to students' and teachers' personal growth and development, such as sports, music and drama, in addition to spaces that facilitate individual and group learning.

### 4. Transformation.

The purpose of *schooling* is to build knowledge in the school community to transform society.

The role of *school design* is to facilitate the integration of facilities and services between schools and communities (Chart 2.11), and engage all stakeholders in defining the purpose of school and the role of school design.



Chart 2.11. Goulburn Ovens Institute of TAFE, Victoria, Australia  
*Designing non-threatening rural architecture.* The design of this facility responded to a specific request by the college director that the building should not be threatening for students from rural areas. This brief led to the concept of the college resembling an Australian shearing shed. The facility, which was economical to construct and uses operable walls to provide maximum flexibility for class organisation, has become a familiar sight to the local community.



## Paul Burke: Refurbishing existing schools in New Zealand

*In New Zealand, the Ministry of Education is giving schools the power to make the decisions they believe will create learning environments for the 21<sup>st</sup> century. (Paul Burke, presenter)*

### Profile

Paul Burke is Group Property Manager at the Ministry of Education, New Zealand. Paul Burke and his team are responsible for land and buildings in 2 300 state schools and delivery of a NZD 350 million annual capital programme. As well as upgrading existing schools, they are responsible for the provision of new schools and the delivery of 100 to 200 additional classrooms built each year to meet increasing enrolments.

### Key points

- **New Zealand** has approximately 2 700 schools and 750 000 students. Between 1990 and 1999, the government spent more than NZD 1.5 billion on school buildings, including NZD 500 million on deferred works.
- In a **survey of schools** conducted in New Zealand in 1999, schools reported on the unsatisfactory state of school buildings, a lack of transparency in funding allocation, and insufficient knowledge of property process and systems.
- In response, the **Ministry of Education** introduced a new property funding structure: the "Five-Year Property Agreements".

### Key projects

#### Five-Year Property Agreements (5YA)

- **Aim.** To allocate funds to schools for school property projects as an entitlement, with no bidding process, based on previous expenditure over the last 25 years. As a result, each school decides on its property priorities and manages its own projects.
- **Implementation.** Introduced in 2000, each school in New Zealand receives funding for property projects on the basis of an agreed schedule of projects to be undertaken at the school over the next five years. The agreement also considers the "School Strategic Plan", which includes assessments of property and available funding and the established 10-year property plan. The total value of projects is based on a pre-determined budget, calculated according to the size of the school and previous expenditure on buildings at the school. The total funding pool available to all schools is based on an annual depreciation calculation for all school buildings.
- **Successes.** Results of a recent survey indicated that 95% of schools were satisfied with the new system, which allowed them to target funding more accurately and spend money on several smaller projects, rather than waiting for larger problems to arise as evidence of need.
- **Challenges.** To improve the quality of information available to school boards, allowing them to prioritise projects more effectively and ensure timely completion of programmes.

#### Cash for Buildings

- **Aim.** To further increase the flexibility of school resource-related decisions by allowing each school to choose how it allocates additional property expenditure.
- **Implementation.** If a school is entitled to extra property – either through roll growth or a property guide deficiency – it can choose to receive property (*i.e.* as a capital cost) or equivalent annual operating expenditure (*i.e.* an annuity deriving from the property cash flow). The annuity can be used by the school as cash to lease a building or to spend on other educational resources such as hiring teachers or purchasing ICT equipment.

Chart 2.12. The property process, New Zealand

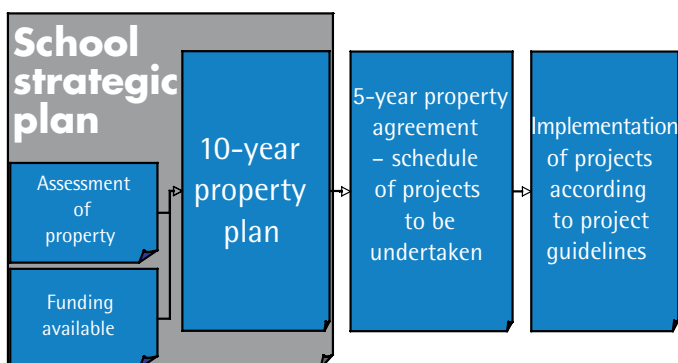
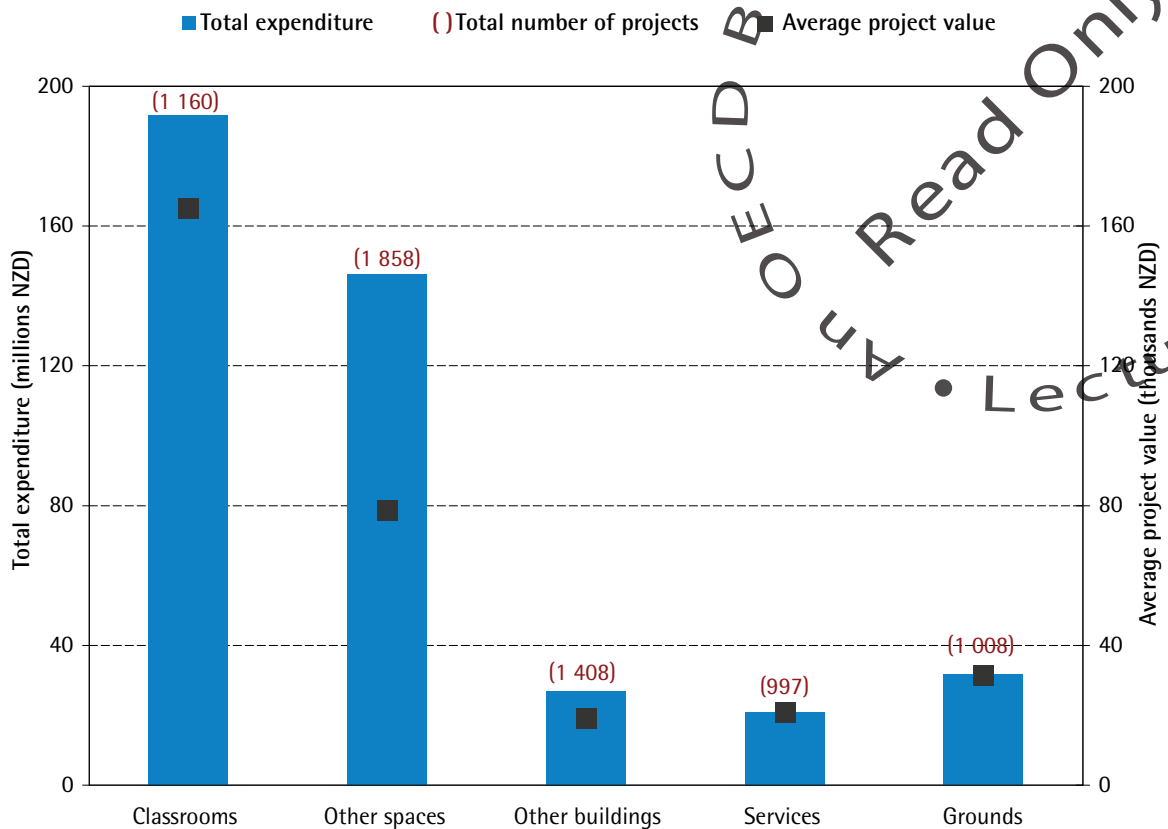


Chart 2.13. Expenditure for 5YA projects, by type of project\*, New Zealand (2000-03)

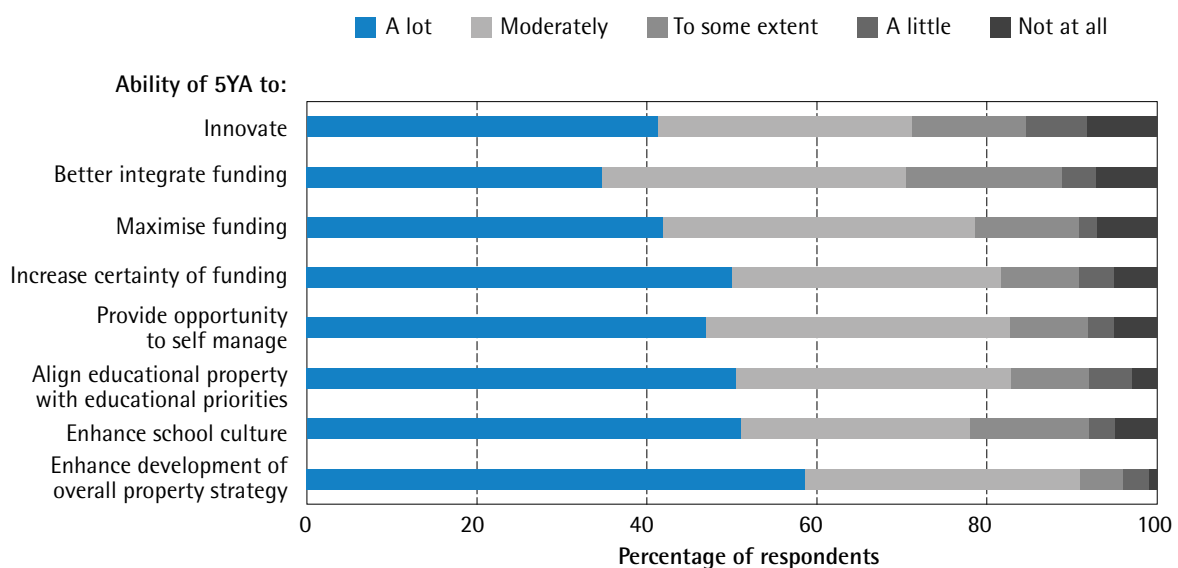


\* "Classrooms" refer to regular educational spaces, in addition to art, gym, music, science and technology rooms; "other spaces" refer to administration (e.g. staff room, offices), ancillary (e.g. outbuildings, walkways, house, dental clinic, shade areas, walkways), library, multi-purpose, pool, special needs and toilet spaces, "other buildings" refer to exterior, interior (e.g. fittings, wall lining), roof, flooring, windows and other buildings; "services" refer to ICT, security, water, electricity, heating, ventilation and air conditioning; and "grounds" refers to paving, playing fields and entrances.

Source: Ministry of Education, New Zealand.

Chart 2.14. Benefits of 5YA, New Zealand (2000-03)

Percentage of respondents\* who believe that 5YAs have provided certain benefits to educational facilities and management:



\* Boards of trustees in participating schools responded to this survey.

Source: Ministry of Education, New Zealand.



## Maurice Dandelot: Facilities for individual integration in Geneva

*In Geneva, there has been a clear change in the way investment is used to promote greater social cohesion in schools. (Maurice Dandelot, presenter)*

### Profile

Maurice Dandelot is Director, Department for Primary Education in the Canton of Geneva in Switzerland. He is responsible for school budgeting and financing. He also oversees school building restoration and renovation and the installation of ICT resources. Before becoming director in 2000, Maurice Dandelot was the Deputy Director of the Geneva Medical-Pedagogical Service, Special Education Division, responsible for planning classes, hiring staff, and organising professional development and training for teachers.

### Key points

- The **Swiss Canton of Geneva** has 150 public primary schools and 35 400 students aged four to 12 years. Although few new schools are constructed in Geneva, all existing schools are being upgraded.
- According to the **1989 School Building Regulations**, a typical school had 16 classes, with 18 to 22 students in each class, 80 m<sup>2</sup> classrooms for mainstream and special education; a gymnasium; and activity, music and movement, and arts and crafts rooms. The regulations were based on the existing concept of teaching and learning:

- **Ideological environment.** Special needs teachers, regular teachers and other staff were specially trained, resulting in a clear separation of teaching roles, and non-native students were well-integrated into mainstream schooling.
  - **Theoretical environment.** Constructivist theories and behavioural models of learning emphasised closely supervised group work and whole-class teaching, with little interaction between students.
  - **Social environment.** Relationships between teachers, students, parents and managers were not well developed. Teachers exerted much influence on the use of the school premises, while parents, students and others had little input.
- In 1994, **primary education reform** challenged existing teaching and learning approaches and school building design. It described three main avenues to reform: individual education pathways, team teaching (i.e. training teachers to work as a team with the same students) and child-centred learning. To achieve this goal, the building programme was altered to include “decompartmentalised” or **open-plan teaching spaces**, requiring in all primary school classrooms:
    - A degree of flexibility in how the facilities are used (i.e. a multi-purpose space).

Chart 2.15. Ecole de la Californie, Geneva, Switzerland

This school is an elaborate example in terms of mobility and possible configurations. It has three features: a multi-purpose space at one end of the corridor, divided by toilets; mobile partitions, allowing the classrooms and multi-purpose spaces to open onto the corridor; and a wall between the classrooms, which can also be opened.





Chart 2.16. Ecole du Vélodrome, Geneva, Switzerland

This design is based on the simple idea of creating a series of bow windows adjoining the corridor. Each bow window houses four classrooms with an additional multi-purpose space. One teacher can supervise all classrooms with the door open.

- Potential use of corridors for certain activities, without increasing the floor area. Thus, corridor space adjacent to classrooms should be available for small groups of students for joint activities such as reading, painting and educational games. The areas do not have to be closed off from the corridor, but they should be clearly identifiable by their volume, lighting, materials, furniture, etc.
- In Switzerland in the 1970s, the concept of "inclusion" for students with disabilities in mainstream educational settings replaced that of "specialised adaptation", whereby a student would attend regular classes with the aid of a personal assistant and ambulatory care. In the last 30 years, the number of students with special educational needs placed in special schools has dropped by 50%. Today, many special needs students achieve full, partial or group inclusion in regular educational settings.



Chart 2.17. Ecole de Veyrier, Geneva, Switzerland

The objective of this project was to create a multi-purpose space by extending the passageway and installing a mobile partition between classrooms and corridors. Mobile cloakrooms separate the multi-purpose space from the circulation area.



## Stephen Heppell:

Once we are “outside the box”, will we still need it?

*Now is the time to consider whether we want the fortress school, the extended school, the distributed school or even no school at all.*

(Stephen Heppell, presenter)

### Profile

Stephen Heppell is director of Ultralab, one of the world's leading research centres in e-learning, which is based at Anglia Polytechnic University (APU), Chelmsford, United Kingdom, and Christchurch, New Zealand. With over 60 staff, Ultralab has been involved in numerous projects and partnerships related to software development and architectural design in education, including the Department for Education and Skill's “Classrooms of the Future” project in Richmond, with Future Systems; “Campus 2000” with British Telecom; and virtual Notschool.net for excluded students. Stephen Heppell is also a professor in information technology in the learning environment at APU.

### Key points

- The objective of Ultralab is to make learning more “delightful” and to create inspired design by harnessing children's creativity.
- Schools must reflect a child-centred world, in which students work and learn through a **collaborative process**. The micro design of schools can encourage or discourage collaborative working, for example, through the use of internal or external curves. The concept of a distributed school, however, means that thousands of students in schools throughout the world can communicate with one another.



### Key projects

#### Gemini

- Gemini is a free computer software developed by Ultralab, in collaboration with Africa Bookcase, that provides a secure forum for posting messages and exchanging ideas, as well as support for video conferencing. To maximise access to ICT, up to five children can work from the same computer simultaneously, and up to four computers can share a standard telephone modem line. More than 50 schools in the United Kingdom and overseas were involved in the pilot project.

#### Notschool.net

- Notschool.net is an online research project that aims to re-engage young people excluded from education back into learning. During its first phase, Notschool.net established a virtual community of 100 young people, who, through the support of mentors, buddies and experts and the use of new technology, were reintroduced to learning. Now in its third phase, Notschool.net is being used by Education Authorities across the United Kingdom and overseas, creating a multinational and supportive learning community.

#### The Page to Stage Platform

- This project explores how technology and theatre can be combined to inspire creativity in the classroom. Building on a project developed by the charity WebPlay, which enables primary school students to create, produce and perform dramatic plays while collaborating with a professional theatre company and other students from around the world, Ultralab is developing a stand-alone resource to enable direct and ongoing communication between professional children's theatre companies and their schools-based audiences. More than 3 000 students will test the resource in 2006.







## John Jenkins:

### Design quality in mainstream and special schools in the United Kingdom

*What is design quality? Most people would agree on the extremes of buildings or features they like or hate, but the answer is very subjective.*

(John Jenkins, presenter)

#### Profile

John Jenkins is a founding partner of Haverstock Associates, a group of architects based in North London. Its mission is to create buildings that inspire and stimulate. Over the last 24 years, the firm has completed a number of projects in education. John Jenkins is currently working with Local Education Authorities and police authorities in the United Kingdom to improve design quality in Private Finance Initiative projects. He is also revising the Building Bulletin on the design of special schools with the Department for Education and Skills, United Kingdom.

#### Key points

- Governments agree that **design quality is important** to maximise student performance and learning opportunities and to allow teachers to facilitate learning most effectively. In addition, design and construction represents a small proportion of the overall cost of a building in its lifecycle. But how is design evaluated and by whom?

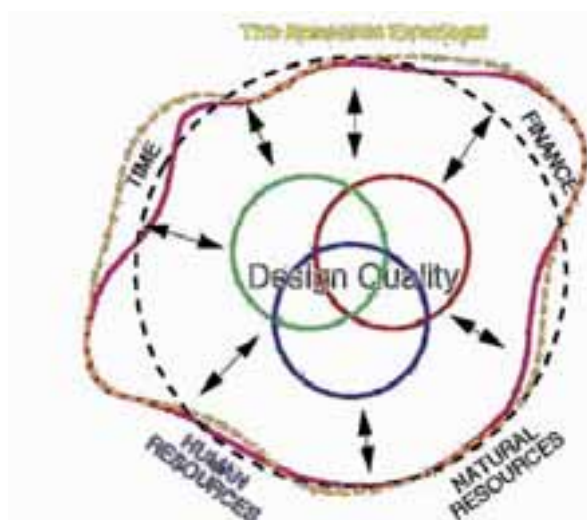


Chart 2.18. Design Quality Indicator model, United Kingdom

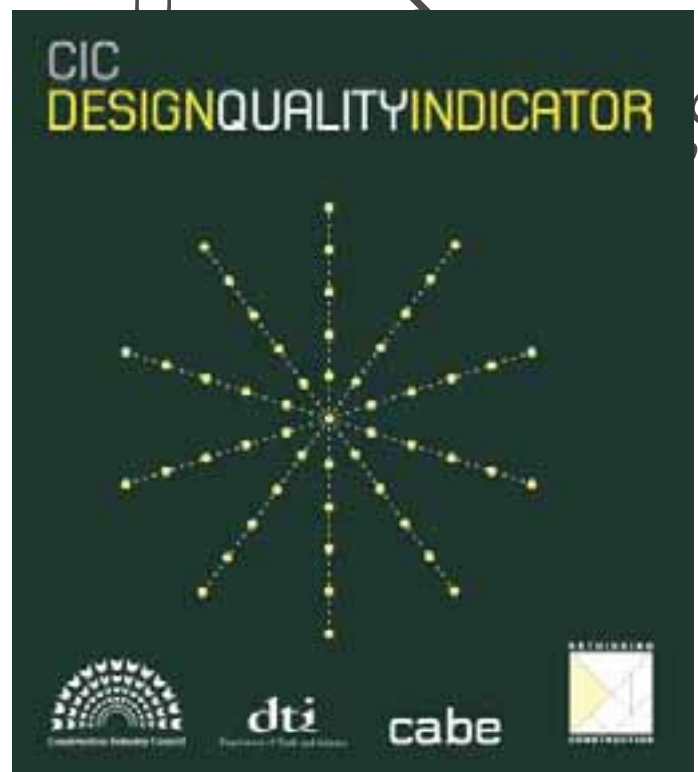


Chart 2.19. Design Quality Indicator publication, United Kingdom

- The **Commission for Architecture and the Built Environment (CABE)** in the United Kingdom has identified five attributes of good design: functionality in use or fitness for purpose, which can be checked against the criteria in the design brief; build quality; efficiency and sustainability, which ensures that the building is completed on time and according to cost and environmental standards; designing in context; and aesthetic quality.
- The **Design Quality Indicator**, launched in 2002, is an online questionnaire for evaluating design quality in terms of functionality, build quality and impact of the building. The questionnaire can be completed by any stakeholder involved in the production and use of buildings, including clients, contractors, building managers and designers. There are four versions of the questionnaire, each of which relates to the phase of the project under examination: briefing, mid-design, pre-occupation and in-use. Results are weighted and graphically presented to highlight comparisons between groups of respondents, different stages of the project and schemes within a portfolio of projects. This tool is currently being developed for use in schools. (See also page 48.)



Chart 2.20. Different perceptions of quality, United Kingdom

- In some schools, inadequate lighting, poor acoustics and lack of space have contributed to school failure, particularly in facilities for students with special educational needs. In response, in 2005, the Department for Education and Skills revised the **Building Bulletin No. 77 on Designing for Pupils with Special Educational Needs**. The new bulletin focuses on the importance of providing quality learning environments in both special schools and regular educational settings. Specifically, it contains practical and technical guidance for Local Education Authorities, designers, education advisers, architects, engineers, building contractors, head teachers and school staff on the planning, briefing and design of accommodation, with improved building standards.

**Impact**

For sections I to L please additionally circle the 3 statements within each section that you feel are the most important for your building

	Strongly Disagree	Disagree	Tend to Disagree	Tend to Agree	Agree	Strongly Agree	Not Applicable
<b>I CHARACTER &amp; INNOVATION</b>							
01 The building provides a sense of security							
02 The building lifts the spirits							
03 Visitors like coming here							
04 The building reinforces the image of the occupier's organisation							
05 The building is widely acclaimed for its quality							
06 The building has character							
07 The building makes you think							
08 There is clear vision behind the building							
09 The building's design and construction contributes to development of new knowledge							

Chart 2.21. Design Quality Indicator online tool, United Kingdom



## John Locke:

# Developing secondary schools to meet the needs of 21<sup>st</sup> century learners at Alfriston College, New Zealand

*The challenge is to create an integrated curriculum with learning leaders driving the courses, but allowing individual learners to have influence while also giving the community some influence.*  
(John Locke, presenter)

### Profile

John Locke is the school principal of Alfriston College, which serves a multi-cultural rural-urban fringe community in New Zealand. He was appointed school principal in 2002, 18 months before the school opened, and was actively involved in the design of the school.

### Key points

- **Alfriston College** opened in January 2004. It was the first state secondary school built in New Zealand for over 20 years, presenting an opportunity to reflect on the learning needs of 21st century students. The college serves up to 1 500 students aged 13 to 19 years. (See also page 14.)
- **Alfriston's design** was influenced by educational facilities in Australia, the United Kingdom and the United States:
  - **Center for Advanced Research and Technology, Fresno, California, United States** (right). Career-focused laboratories surround a common breakout area. The four areas of the curriculum are divided into career-



based clusters, and senior students in each cluster complete industry-based projects in laboratories, receiving additional credit for courses completed.

- **Australian Science and Mathematics School, Adelaide, Australia** (right).

Modular furniture is located within

a learning commons and media area. This school contains nine learning commons, each of which caters for up to 50 students, nine studios, large open circulation break out spaces and a range of meeting/ seminar rooms.



- **Reece College, Devonport, Tasmania, Australia** (right). Flexible multi-use spaces for music, dance, drama

and food technology are separated by operable walls.



- **Inter-District Downtown School, Minneapolis, Minnesota, United States** (right). Practical furniture has been designed for teachers.



- **Brooke Weston City Technology College, Northamptonshire, United Kingdom** (right). Building and furnishing quality are exemplary.



Chart 2.22. External spaces, Alfriston College, New Zealand







Chart 2.23. Flexible learning spaces (top) and exterior view (bottom), Alfriston College, New Zealand

- Students and parents involved in the planning phase of Alfriston College agreed that the school needed to be **flexible**, resulting in the use of moveable partitions between learning spaces that can be configured for groups of 15 to 120 students. This design facilitates cross-curricular learning, which focuses on developing the independent learner. Learning space is provided in one of five "Whanau" or "schools within a school", where student leadership is nurtured and community participation is encouraged. (See also page 24.)
- At Alfriston College, New Zealand, teachers are "learning leaders" rather than instructors, and students are encouraged to learn using a **variety of tools**, including elements of the school's physical environment. The site includes a lower walkway marked out in metres, a cubic metre sculpture, mathematical patterns in the courtyard, lines of longitude and latitude marked in the paving, a transparent lift, a wetland eco-system to collect rainwater, CO<sub>2</sub> monitors, glass-fronted network servers in the classrooms, truth windows to show the construction and signage with GPS co-ordinates.
- **Information and communications technology** is readily available throughout the school, which is also networked for wireless communication. Students use flat-screen personal computers on purpose-designed desks with wheels, rather than individual laptops. Music and sound are important in the college, and a media matrix delivers a "soundscape" through any one of 320 speakers on campus. (See also page 21.)
- During the planning of Alfriston, students and parents strongly advocated a **sustainable design** for the school. As a result, sustainable features were incorporated into the design, which are visible in the school's curriculum and daily life. Natural light is used in the entrance to the auditorium. The building was installed with improved insulation, double glazing and tinted glass, a gas-fired heating system, a condensing boiler instead of a conventional boiler, atrium-assisted natural ventilation in addition to mechanical ventilation, and a rainwater recovery tank and reuse system for toilet flushing and irrigation. Durable building supplies fabricated from unrefined materials were used.



## Prakash Nair:

### Design strategies for tomorrow's schools

*The school of the future has already been designed; we only have to look at the modern workplace. (Prakash Nair, presenter)*

#### Profile

Prakash Nair is a school planner, architect and educational technologist. He is president of Fielding Nair International, an award-winning international school planning firm based in New York City. He recently completed work on a Rockefeller Foundation grant to apply world-class school planning and design principles in New Jersey's most impoverished districts. Winner of seven international school planning and design awards, Prakash Nair won the MacConnell Award in 2003.

#### Key points

- **Tomorrow's schools** will reflect two basic educational principles, which are not always reflected in current educational models that value uniformity and academic achievement, and curricula that are often unsuited to the demands of a changing global economy:
  1. Student engagement is the most important condition for learning.
  2. Confidence and social skills are the most important qualities for success.

- **Tomorrow's school design** is a potential catalyst and driver of change for new educational models that value students' creativity and multiple forms of intelligence (i.e. "music smart", "sports smart", "world smart", "self smart", "spatial smart" etc.).
- **Educational facilities do have an impact on learning.** Environmental factors such as daylight, acoustics, indoor air quality and access to food and beverages affect our physiology; the space in which we learn can evoke an emotional response, affecting our psychology; and a particular type of space can foster or inhibit our behaviour in individual or group settings.
- **Developing effective school facilities** requires good site selection, planning, building design, building performance and postoccupancy evaluation.
- **From Deepti Nair's perspective**, the daughter of the presenter and a high school student in the United States, although she attends a prestigious school, the building is "boring", teachers are authoritarian, and the system and building were designed to control. She observed that this environment does not reflect the roles, relationships and responsibilities found outside the classroom in the "real world". She showed examples of preferred spaces for students and adults, such as large open areas with ample natural light, small group areas, areas for eating, drinking and working, areas for creative activities, large spaces for dance and drama, and wireless communications areas to allow laptops to be used anywhere including outside.

#### Chart 2.24. Millennium High School, New York City, United States

*Buildings that engage students.* This school is housed in an existing office building in the Wall Street area. Financed by private companies, the original school plans included corridors and classrooms. The final plan resembles a modern office with glass partitions. For the first six months after the building's opening, students continued to walk through the open plan along imaginary corridors. To accommodate the school's extensive reading literacy programme, in which students read and write for ten periods per week, each classroom includes an alcove that serves as a reading, conference and library area. Wooden furniture suggests the idea of a library or college, and tackable walls allow student work to be displayed and read by others. (See also page 27.) Photo by Richard Cadan.





Chart 2.25. Lake Country School, Minneapolis, Minnesota, United States  
*Buildings that promote "learning by doing".* This independent Montessori school, founded in 1976, aims to foster the social, emotional, intellectual, physical and spiritual development of the child. It currently serves nearly 300 children between the ages of three and 14 years. In the last five years, funds were raised to renovate two floors of the school and to develop the Land School. The Land School is a 160-acre community farm – comprising a farmstead, forests, fields, ravines and a pond – that teaches the school community to be "good stewards of the land". (See also page 12.)





## Pauline Nee:

### Transforming existing schools in Southwark, United Kingdom

*Southwark's policy is that all schools should be inspiring, inclusive and open to the community.*  
(Pauline Nee, presenter)

#### Profile

Pauline Nee was appointed architect and building surveyor for the Southwark Council in 1994. She is currently head of Southwark Building Design Service, the council's in-house architectural service, which is committed to producing high quality schools in consultation with clients. The service has overseen most of the improvements made to the more than 100 schools in Southwark.

#### Key points

- **Southwark**, located in South London, has a large ethnic population. The Southwark Local Education Authority (LEA) is responsible for over 100 schools. The changing curriculum created the need for new, large multi-purpose spaces in schools: spaces for group and individual work and social activities. In response, over the last ten years the Southwark LEA has embarked on a programme to improve and extend most existing schools. To avoid similar problems in the future, new facilities will allow space for future expansion.



Chart 2.26. Cobourg Primary School, Southwark, United Kingdom  
*Adapting older buildings.* This school, which is a typical board school built in the early 1900s, is characterised by a load-bearing brick and pitched tiled roof. It is spacious, warm in winter and cool in summer, and relatively easy to renovate using traditional, economical building techniques. The traditional building style is well liked by the community, often acting as the heart of communal activity and a haven from the pressures of urban living.

Chart 2.27. Spa School, Southwark, United Kingdom  
*Creating attractive outdoor spaces.* The Victorian Garden project was developed to help students at this special school for autistic children appreciate the social, ecological and historical links with their Victorian school, Southwark Park and the surrounding area. The students created the garden using plants and techniques from the Victorian era. An archway, bird boxes, seating and a pergola were also constructed. Two students designed a mural of Victorian floral design, influenced by the designer William Morris.





Chart 2.28. Alfred Salter School, Southwark, United Kingdom

*Creating innovative facilities for students with special educational needs.* Opened in 1995 to meet the growing demand for school places on the Surrey Docks Peninsula, this school is a recognised centre of excellence for providing for students with special educational needs. The school grounds, which include a large environmental garden and pond, offer a stimulating environment for students. The school has extensive ICT facilities, with a computer suite in the gallery, and interactive whiteboards, a projector and Internet access in all classrooms.

- The Southwark LEA is committed to breaking down the potential isolation of modern urban living by encouraging school communities – including students, teachers, parents and adult learners – to become involved in the life of their school.
- Three-storey board schools, built at the end of the 19<sup>th</sup> century, comprise much of the **existing building stock** in Southwark. These schools are valued by the community and relatively easy to update. Other school buildings constructed in the 1960s require significant maintenance. They are lightweight, poorly built and require recladding. Due to limited space, some schools must use roof tops as play areas.



Chart 2.29. Southwark City Learning Centre, Southwark, United Kingdom

*Creating new spaces for technology.* The Southwark City Learning Centre, completed in early 2002, is based at the Sacred Heart School in Camberwell New Road. It contains two large computer suites, each suitable for teaching whole classes and a third all-purpose room for teaching away from computers, for video conferencing, or for other meetings.



## Mukund Patel:

### Emerging themes of 21<sup>st</sup> century learning environments

*The future of school design will be satisfying – we will achieve more – but will also be challenging.*  
(Mukund Patel, presenter)

#### Profile

Mukund Patel is head of the Schools Capital (Assets) Division, Department for Education and Skills, United Kingdom. The unit advises ministers and officials on all aspects of school buildings, including school premises regulations, asset management plans and costs. It encourages best practice in design and management of school buildings by publishing guidance documents and undertaking demonstration projects. Mukund Patel is currently the chairman of the OECD Programme on Educational Building and vice president of the Society of Chief Architects in Local Authorities.

#### Key points

- **Raising educational standards** in schools in the United Kingdom is a high priority for the current government, as is reflected in the large increases in capital expenditure. A number of national school design initiatives (presented below) are being implemented by the Department for Education and Skills to raise standards, enhance teaching and learning, and address workforce issues. The concepts that inspired the exemplary designs for these projects have been published in a series entitled "Schools for the Future".

- A number of emerging themes in future school design have emerged from this work:
  - Facilities should be **flexible, adaptable and relocatable**, incorporating a range of spaces, such as clusters of classrooms, which are responsive to future changes, including ICT.
  - Facilities should provide **social spaces and informal study areas**. School design should maximise circulation while avoiding long, narrow corridors. The heart of a school can be created through design, with open access learning areas, attractive dining and toilet areas, and breakout spaces for small groups.
  - Buildings and the surrounding landscape should be **inspirational**, capturing the imagination and demanding the respect of the community it serves.
  - Design should be **inclusive and accessible** for both students with special needs and the school community, inside and outside school hours.
  - Design should use innovative ideas to maximise the **comfort and sustainability** of school facilities, through effective use of energy, natural daylight, ventilation, acoustics and sustainable materials.
- **The challenges** to future school design include the capacity of the construction industry (*i.e.* Are there enough designers with sufficient experience and skills to satisfy demand? Will the industry overheat and costs rise?); viability of new procurement techniques such as Private Finance Initiatives; and involvement of clients in the design process.

Chart 2.30. Flexible and adaptable facilities, United Kingdom

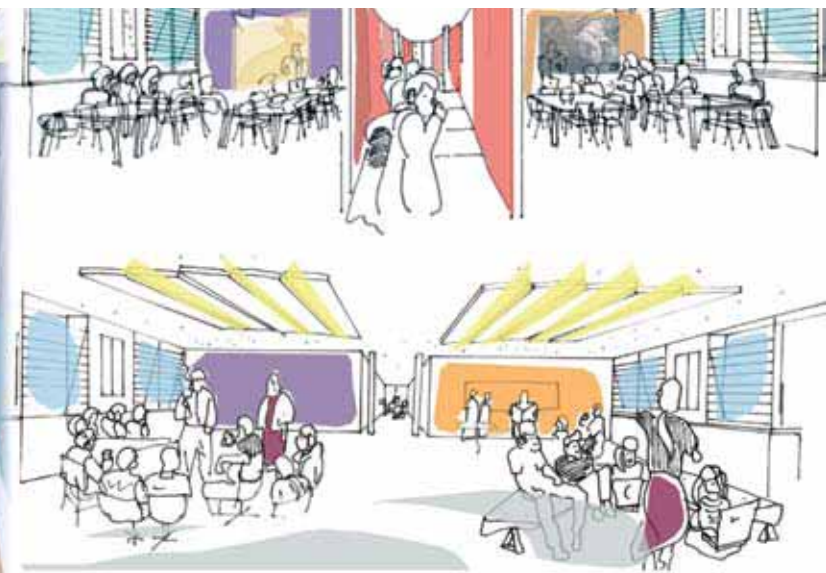




Chart 2.31. Social spaces and informal learning areas, United Kingdom

## Key projects

- **"Building Schools for the Future"** is a government initiative to rebuild or renew every secondary school in England over a ten to 15 year period. In 2003, four "Pathfinder" Local Education Authorities were selected to help shape and implement the first wave of the programme. Ten schools were selected to participate in the first wave, which will be completed in 2006. Each wave will involve projects that demonstrate innovation both within and across schools and their communities. Schools were selected through a competitive process on the basis of three criteria: local deprivation and impact of standards, educational vision, and delivery capacity. GBP 2.2 billion is being invested in new secondary schools each year.
- The **Academies Programme** aims to address educational under-attainment and to improve standards by constructing new secondary facilities to replace failing schools. Academies are established by sponsors from business or voluntary groups, working in partnerships with central government and local education partners. Sponsors and the Department for Education and Skills (DfES) provide the capital costs for each academy, and running costs are met in full by the DfES. To date, six academies, including the Bexley academy (see pages 82–83), have been completed, and at least 53 are planned by 2007, including 30 in the London area by 2008.
- **"Classrooms of the Future"** aims to harness students' ideas about innovative learning environments to challenge current thinking about school design. Thirty schools were selected to participate in the pilot project. (See also pages 54–55.)
- **City Learning Centres** were developed to improve access to the latest ICT-based learning tools for entire school communities in inner city areas. To date, 85 centres, including the Bristol and Southwark City Learning Centres (see pages 20 and 72), have been completed.



## Pit Li Phan:

### The school as a learning tool in Singapore

*What possible form might a school building take if the educational values of active participation, integration and collaboration were to be translated into steel, concrete, glass and space?*  
(Pit Li Phan, presenter)

#### Profile

Pit Li Phan is the senior vice-president of the Education Division at CPG Consultants in Singapore. CPG Consultants provides a full spectrum of professional design and development consultancy services, and is ranked among the top 200 international design firms, winning more than 200 international and local awards. The Education Division is composed of a multi-disciplinary group of professionals specialised in the design and development of schools. In the past three years, the group has been involved in designing more than 75 schools in Singapore and overseas. Pit Li Phan also collaborated with Robert Powell on a book entitled *The Architecture of Learning: New Singapore Schools*, which examines the influences on school design for the new millennium.

#### Key points

- **Current thinking on learning** reflects a shift away from the idea that students are passive receptors of knowledge, to one that encourages students to be active constructors of knowledge. Current learning theory also supports a holistic, experiential, collaborative approach, where students work together to investigate concepts and problems in a way that can be applied directly to the world around them.
- **Architectural elements can be used as teaching props**, enabling students to link mathematics, music, culture and arts through an engaging and participatory process. For example, floor patterns can be inspired by geometrical shapes, and a ceiling can reflect the stars and constellations. Doors, windows and entryways can become objects to teach about shapes, sizes and patterns, and planar elements can become dynamic canvases that capture the varying moods created by light and shadow.

Chart 2.32. Ceilings as learning tools, Victoria School, Singapore  
Photos by CPG Consultants Pte Ltd.





Exploration Patch

Bio Pod

Learning Garden

Victoria Pool

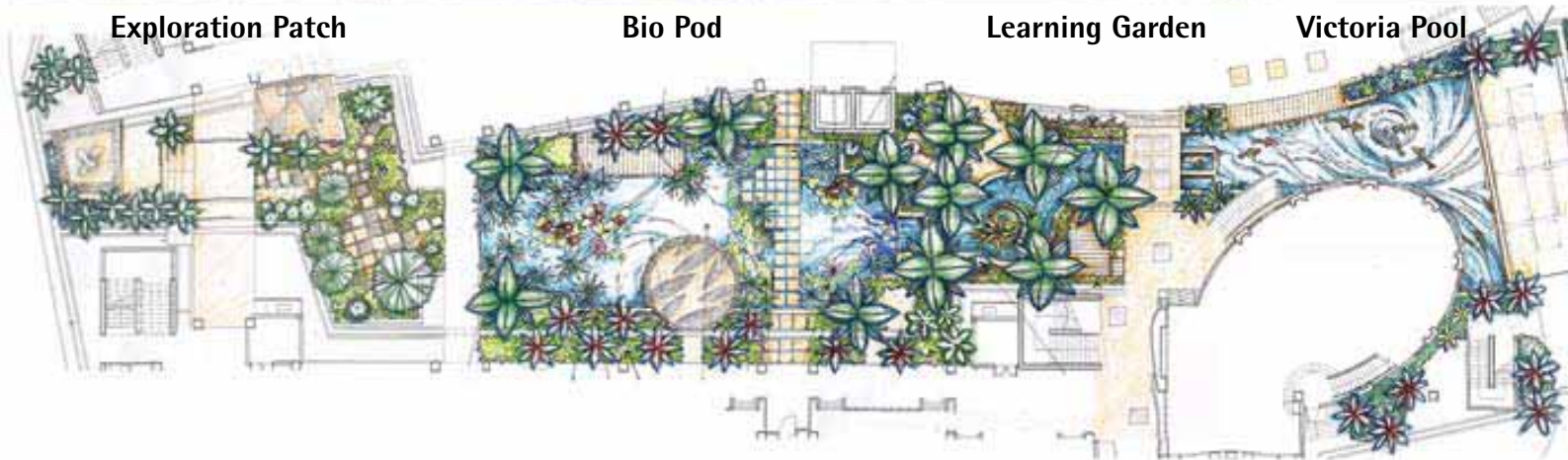


Chart 2.33. Eco-Street, Victoria School, Singapore

- **Building systems can provide a three-dimensional learning tool**, showcasing real-life connectivity. Typical buildings house different structural systems, lighting systems and service elements to manage rainwater discharge, air-conditioning, fresh air, etc. These systems, if strategically exposed around the school and installed as hands-on learning tools, can provide valuable lessons on how they work, how buildings come together, or how physics, chemistry and environmental science can be linked.
- School buildings and landscaping are often designed independently. However, facilities and landscapes can be better integrated to create a total learning environment of **outdoor classrooms and living laboratories**.

## Key projects

### Victoria School

- Victoria School is Singapore's second oldest school. In May 2003, the school moved to their new campus, and an "Eco-Street" was constructed through the centre of the school, to transform outdoor spaces into the

learning and social hub of the school. There are no distinct boundaries between building and landscape, with linkways, bridges and footpaths weaving through the vegetation. The Eco-Street is designed as a "living laboratory", providing opportunities for hands-on experiments and examination, enabling students to learn about ecology and the life sciences. (See also page 30.)

### National University of Singapore High School of Mathematics and Science

- This high school, which is managed by the university with on-site student accommodation, incorporates innovative learning tools with interactive social spaces. Architects worked with teachers in workshops and brainstorming sessions to find an iconic element to represent the new school and to maximise the capacity of the school as a learning tool for students with aptitude in science and mathematics. Future expansion will allow opportunities for the study of climate, alternative sources of energy, environmental pollution and the performance of the building. (See also pages 33 and 45.)



## John Sorrell:

### "joinedupdesignforschools" programme, United Kingdom

*"joinedupdesignforschools" inspires students by putting them in the driving seat as the client.*  
(John Sorrell, presenter)

#### Profile

John Sorrell is co-chair of the Sorrell Foundation, an action-oriented charity established by John and Frances Sorrell to inspire creativity in young people and improve quality of life through design. He is a regular speaker and broadcaster on design, creativity and identity. In 2002, he published a book entitled *Creative Island*, featuring inspired design from the United Kingdom.

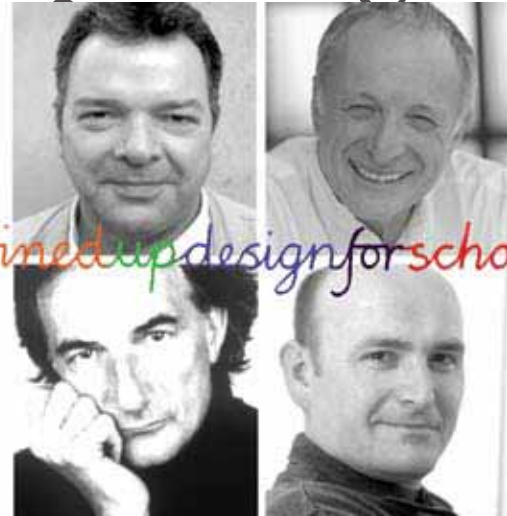


Chart 2.34. "joinedupdesignforschools" programme, United Kingdom  
"joinedupdesignforschools" has successfully brought together the design industry – from fashion, interior and graphic designers and Web designers, to architects and urban and industrial designers – to help students address problems in their schools.

#### Chart 2.35. Barlow Roman Catholic High School, Manchester, United Kingdom

*Making school toilets cleaner and safer.* The original toilets at this school were built in three separate blocks, making them difficult to supervise. Facilities were frequently damaged, and prone to student bullying and smoking. As part of the "joinedupfordesignforschools" project, students, teachers, parents, cleaning staff and designers from Barlow and Judge Gill worked together to create a final large, bright, attractive, new toilet block to be used by the whole school, including teachers. The glass handwashing area is easy to monitor, the seamless grey resin floor is easy to clean, non-contact taps reduce the risk of germs, and there is a separate trough for washing boots.



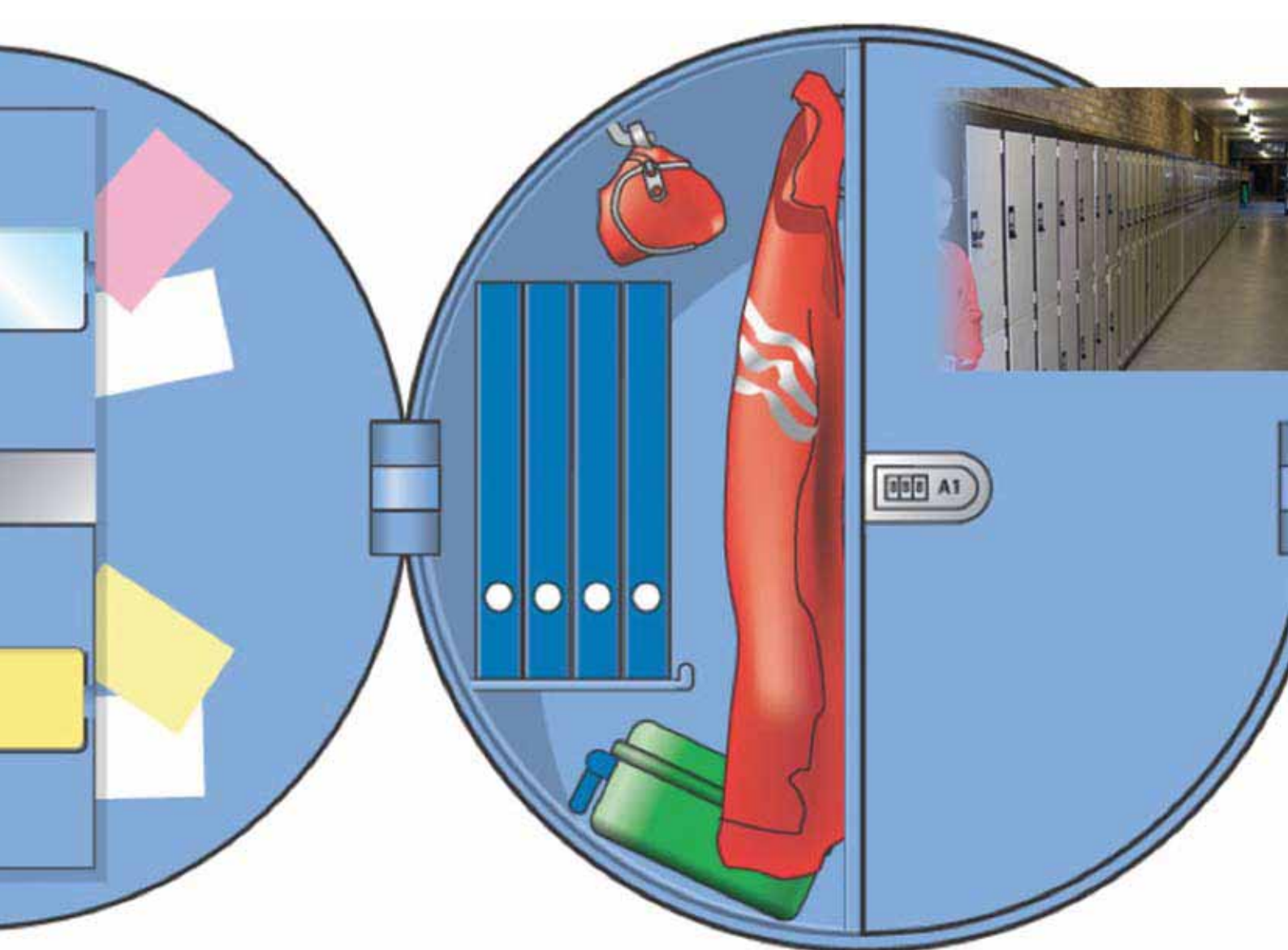


Chart 2.36. Plumstead Manor School, Greenwich, United Kingdom

*Designing new storage spaces.* In this project, designers Priestman Goode worked with students to design new lockers to solve problems of graffiti, vandalism, insufficient space and lost keys. Students wrote a play to illustrate what they wanted and visited a locker factory. One of the proposed solutions was L-shaped tessellating storage spaces with combination locks, and a carefully designed interior layout including space to hang coats and to secure books and equipment. According to another proposal, lockers would be fabricated from recycled underground pipes.

## Key points

- In "joinedupdesignforschools", a programme created by the Sorrell Foundation, designers work with teams of students to find a design solution for common problems within the school. Ideas from students, the "real" consumers, drive the design briefs, thus providing the catalyst for change in the school.
- Each project has **four phases**:
  1. **The challenge.** The client team, which comprises ten to 15 students selected by the head teacher, identifies the issue to be addressed.
  2. **The brief.** The team creates a brief to demonstrate the problem to the designer.
  3. **The conversation.** Over a three-month period, the client team meets with the designer, completes visits and discusses the designer's original ideas.
  4. **The concept.** A final design concept is accepted by students, and the solution is presented to the school community.
- After the completion of a successful pilot project involving seven schools in 2000-01, in 2002 the Department for Education and Skills, United Kingdom, extended the initiative to 100 schools in a three-year programme. By mid-2004, 100 students from 65 schools had worked with 50 designers.
- Projects completed to date revealed a number of common problems in schools involving toilets; social, sixth form and dining spaces; student storage; school uniform design; and school identity.
- The success of the programme can be attributed to listening, inspiring and exposing students to new experiences. Design solutions have been modest and affordable, and have made an enormous difference to the daily life of the average student in the schools.



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## SECTION III

### SCHOOL VISITS, LONDON AREA



*First we shape our buildings, then they shape us. (Winston Churchill)*

*Where function does not change, form does not change. (Louis Sullivan)*



## The Business Academy, Bexley

**Project objective** To transform a school in difficulty through Public-Private Partnership. The management of Bexley, like other academies (see page 74–75), was transferred from the Local Education Authority to education trusts, with financial support from the government.

Educational and design concept		Design features
<b>Flexibility and openness</b>	Three, three-storey courtyards and atria link compact, transparent business, art and technology learning spaces. Teaching spaces are separated by moveable partitions. (See also page 12.)	
<b>New technologies</b>	The large business courtyard in the main entrance houses a mini stock exchange. The large plasma screens allow students to experience the working conditions of a modern trading floor.	
<b>Accessibility</b>	The courtyard also serves as the central social point during school hours and for out-of-hours activities for the community. A café is situated on the ground floor, in addition to a theatre, television studio, editing suite and gymnasium above.	
<b>Comfort and sustainability</b>	A double-layered façade with external shading louvers automatically tracks the sun's path, minimising the building's energy use in summer and reducing heat loss in winter. (See also page 31.)	
<b>Type of construction</b>	<i>School replacement.</i> Bexley replaces a secondary school on the Thamesmead Estate, which was built by the Greater London Council in the 1960s.	
<b>Description of construction</b>	This three-storey, steel-framed building with exposed pre-cast concrete floors is raised 0.5 m above ground level on 20 m piled foundations to avoid flooding. External walls are curtain glazed with external sun shading.	
<b>Construction period</b>	September 2001 – September 2003	
<b>Level of education</b>	Secondary (11–18 years), co-educational	
<b>Current enrolment</b>	1 050 (2003)	
<b>Student capacity</b>	1 350	
<b>Sponsors</b>	Sir David Garrard, Garrard Education Trust	
<b>Design team</b>	Fosters and Partners	
<b>Cost of construction</b>	GBP 31 million (GBP 28 million public and GBP 3 million private funds)	

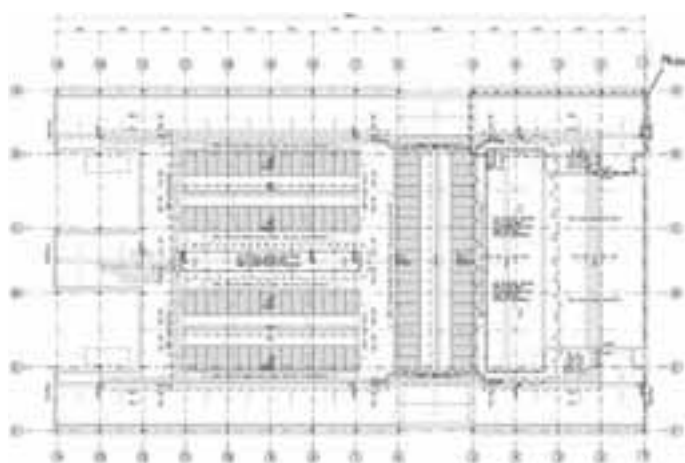


Chart 3.1. Roof and ground floor plans, Bexley





Chart 3.2. Floor to roof, Bexley



Chart 3.3. Internal courtyard, Bexley



Chart 3.4 Exterior façade, Bexley



## The Charter School, Southwark

**Project objective** To create a new local secondary school in Southwark.

### Educational and design concept Design features

**New technologies** All classrooms are equipped with computers and interactive, electronic whiteboards. The school has a modern design and technology suite, science laboratories, an art and design suite, and music and drama rooms.

**Accessibility** The new hall has improved access, with level seating, a lift, a stage that changes levels and an acoustic partition. Installation of ramps and lifts have made all parts of the building accessible for the ten students requiring wheelchair access.

**Comfort and sustainability** The roof, which has transparent downpipes, is used to collect solar energy and rainwater for recycling. Photovoltaic panels also provide electricity. Sedum roofs were installed to enhance insulation. Overheating is controlled by high-performance double-glazing, and ventilation systems – such as external louvers activated by CO<sub>2</sub> sensors and hold-open stops on classroom doors – keep the building cool in summer and warm in winter.

**Type of construction** *School renovation.* The school, constructed in pre-cast concrete with a steel frame and composite concrete floors, was originally built in the mid-1950s as the Dulwich High School for Boys. This school closed in the late 1990s. Soon after, more than 1 000 parents lobbied for the opening of a new school, which was approved in 1999.

**Description of construction** The school was completed in two phases. In Phase 1, two existing blocks were transformed to provide an administration area and teaching areas for Year 7 enrolments. The courtyard block was also opened up and roofed over to form the school's new steel-framed atrium entrance and foyer. Glazed walkways lead out to a series of re-landscaped courts. In Phase 2, the main four-storey teaching block was stripped back to the structural frame, asbestos was removed, and the block was rebuilt and re-clad with a multi-coloured patterned façade. Future work includes renewal of the gymnasium, replacement of the original pipework and radiators, and modernisation of the kitchen.

**Construction period** January 2000 – April 2003

**Level of education** Secondary (11–18 years), co-educational

**Current enrolment** 540 (2003). The school opened in September 2000 with a first-year intake of 180 students. Enrolment will expand each year until school capacity is reached.

**Student capacity** 1 200

**Design team** Penoyre and Prasad Architects. In 2003 the architects were awarded a RIBA (Royal Institute of British Architects) prize for the design.

**Cost of construction** GBP 17 million (public funds)



Chart 3.5. Aerial view and ground floor plan, The Charter School





Chart 3.6. Rainwater harvest tanks, The Charter School



Chart 3.7. Covered entrance block, The Charter School



Chart 3.8. Entrance, The Charter School



## City and Islington College, Centre for Lifelong Learning, Finsbury Park

**Project objective** To create a new adult education facility from a school originally built in the 1880s. This project is part of a GBP 60 million investment in further education facilities in North London. The college is also reducing the number of campuses from ten to three: Finsbury Park, Holloway and Angel.

Educational and design concept	Design features
<b>Flexibility and openness</b>	A variety of different classroom sizes were created to meet the different needs and sizes of adult education classes. The central atrium provides an attractive, open social space.
<b>New technologies</b>	All classrooms for ten or more students have Internet connections, ceiling-mounted projectors, a teacher's PC with DVD player, an independently wired video player, a whiteboard and a projector screen.
<b>Accessibility</b>	The three-storey glazed façade with views into the atrium, which has neon sculptures on the ceiling, is inviting for locals, many of whom are from immigrant and ethnic communities. A public library is accessible through another entrance to the building to encourage users to enrol in the college.
<b>Comfort and sustainability</b>	High-level clerestory windows provide natural ventilation. Solar shading on south-facing windows minimises heat gain. High-ceilinged, exposed concrete rooms on the new building's ground, first and second floors help absorb heat during the day while giving a feeling of space. Reflections from top-lit spaces bring natural light into the heart of the building. Lights in the toilets illuminate automatically on entry.
<b>Type of construction</b>	<i>School rebuild and renovation.</i> A four-storey Victorian board school located on the site was adapted and reused by partly hollowing out the building and wrapping it around with the new building. Narrow boys and girls staircases have been replaced with bridges, walkways and lifts. (See also page 15.)
<b>Description of construction</b>	From the façade of the old school, two new three-storey wings reach forward to the frontage on either side of a top-lit atrium to form the fully glazed front entrance with a dark pink canopy. A series of staircases and walkways leads to classrooms, twisting through two atria. The building has a simple <i>in situ</i> concrete frame with rounded coffered floor slabs and rendered white painted walls.
<b>Construction period</b>	September 2001 – January 2004
<b>Level of education</b>	Post-secondary, non-tertiary (over 18 years)
<b>Sponsors</b>	Finsbury Park Partnership
<b>Design team</b>	Wilkinson Eyre Architects
<b>Cost of construction</b>	GBP 8.6 million

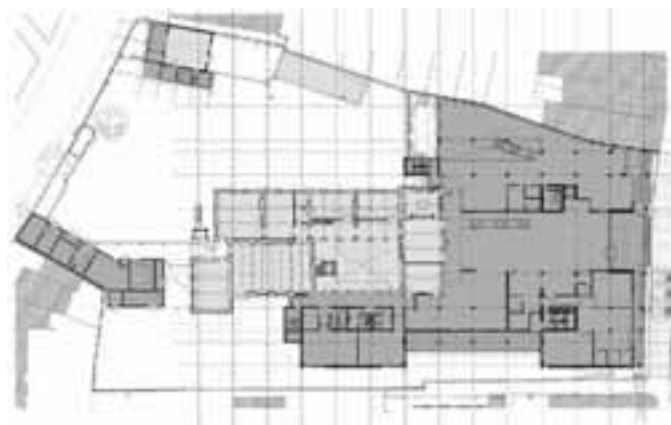


Chart 3.9. Section and ground floor plans, Centre for Lifelong Learning, Finsbury Park



Chart 3.10. Top-lit atrium, Centre for Lifelong Learning, Finsbury Park



Chart 3.12. Foyer, Centre for Lifelong Learning, Finsbury Park



Chart 3.11. View from the street, Centre for Lifelong Learning, Finsbury Park



## Kings Avenue Primary School, Lambeth

**Project objective** To create a new identity for the school, making it smaller and more welcoming for the local community. The primary school was rebuilt as part of the Borough of Lambeth's *Action for Education* primary school development strategy which, in the face of decreasing school-age populations, resulted in the amalgamation and closure of ten schools to fund four new schools.

Educational and design concept		Design features
<b>Openness</b>		A wide-corridor circulation system was designed for the two teaching blocks and atrium. All classrooms on the ground floor open on to outdoor teaching rooms, leading to carefully landscaped play and activity areas for students, teachers and the community, including trails, a performance space, sport pitches and a changing block. A floodlit ball court was constructed as part of the "Space for Sport and Arts" programme.
<b>New technologies</b>		The school is cabled for flexible IT communications.
<b>Accessibility</b>		The facility was designated as a "centre of excellence" for students with visual impairments. The design features a bright colour coding system, with a continuous yellow stripe in the green studded rubber courtyard flooring, and increased daylighting from courtyards, roof lights and large windows in corridors. The library and IT room can be used by the local community, with controlled access.
<b>Comfort and sustainability</b>		Natural daylight and ventilation are maximised through the use of shading to reduce heat gain and excess of light. However, windows in the existing school must be opened for natural ventilation, letting in noise from the busy road adjacent to the school. The roof has a mono-pitch steel standing seam finish with zinc "windcatcher" chimneys, which help ventilate the new classrooms. Artificial lighting responds to daylight levels and is centrally controlled.
<b>Involvement of stakeholders</b>		Teachers and designers used the project as a learning tool in classroom workshops. Students selected the colour scheme and design of play areas. (See also page 37.)
<b>Type of construction</b>		<i>School extension and renovation.</i> The new school modifies and extends the original buildings to provide eight new classrooms, with lifelong learning facilities for the local community.
<b>Description of construction</b>		Six classrooms were added to the two-storey block to form a T-shape, two classrooms have been added to the one-storey block, and the old link between the two original blocks was rebuilt to form a new reception area with ramps and a lift. The proportions and window patterns from the original school were used to blend the old and new parts. The muted colours of the external materials contrast with the bright yellow doors to both buildings and with the modular brown panes of the original elevations. The extensions have an oak cladding, projecting timber <i>bries soleil</i> and galvanised steel balustrades to the first-floor access deck.
<b>Construction period</b>		February 2001– September 2002
<b>Level of education</b>		Primary (3–11 years), co-educational
<b>Current enrolment</b>		574 (2004)
<b>Student capacity</b>		540, including 15 students with visual impairments
<b>Sponsors</b>		Public funding (GBP 4 million)
<b>Design team</b>		Shepherd Epstein Hunter
<b>Cost of construction</b>		GBP 4 million



Chart 3.13. Elevation and ground floor plans, Kings Avenue Primary School



Chart 3.14. Floodlit ball court, Kings Avenue Primary School



Chart 3.15. Corridor, Kings Avenue Primary School



Chart 3.16. Entrance, Kings Avenue Primary School



# Kingsdale Secondary School, Southwark

**Project objective** To create a new, inspirational central school environment for a low performing school by remodelling two underused open courtyards. (See also page 49.)

## Educational and design concept Design features

<b>Flexibility and openness</b>	To provide an open, attractive space, architects demolished the assembly hall to create a 3 200m <sup>2</sup> covered internal courtyard; built a new auditorium across and dividing the new courtyard with a library under the raked seating; constructed a first-floor gallery surrounding the courtyard, which is linked to the staircases; removed some of the narrow corridors; and provided staff bases to serve each discipline. These new staff bases have been formed within the existing school structure with a plate glass office partitioning system.
<b>New technologies</b>	A computer training suite on the second floor of the building contains 90 computers, whiteboards, video conferencing equipment, research areas with wireless facilities, an e-learning area, a video editing facility and an ICT room for science curriculum software. The school has four multi-media rooms, and wireless technology is available in parts of the school.
<b>Accessibility</b>	Access has been improved by the construction of new staircases, a lift and a bridge. A new sports hall, all-weather pitch and running track will be open to the surrounding community.
<b>Comfort and sustainability</b>	The courtyard is covered with an ETFE (ethylene tetrafluoroethylene) roof, which controls solar gain. The cushions are printed with photosensitive stripes, which darken when exposed to sunlight to control heat and glare. A new dining room area was created in one half of the atrium, and the existing gymnasium and music blocks were modernised to improve ventilation, lighting and sound insulation.
<b>Involvement of stakeholders</b>	Teachers, students and others from the local community consulted with a group of architects and educationalists for 18 months to identify how to improve the school buildings. Kingsdale was selected in 1999 as the site of the first "School Works" project aimed at measuring the impact of the quality of the architecture on educational performance.

**Type of construction** *Remodelled.* The original lightweight, system-built flat roof building, constructed in 1959, was in a poor state and failed to meet curriculum requirements.

**Description of construction** The new roof over the courtyard is a tubular steel cambered truss structure supporting an ETFE inflated cushion membrane. The new roof required no foundations; it was superimposed onto the existing column structure and tied to the ground with a bracing frame in the courtyard. The new auditorium is a timber and plywood geodesic dome.

**Construction period** 1999 – December 2004 (Phases 1 and 2)

**Level of education** Secondary (11–16 years), co-educational

**Current enrolment** 1 153 (2004)

**Student capacity** 1 200

**Design team** De Rijke March Morgan Architects

**Cost of construction** GBP 11 million (public funds)



Chart 3.17. Section and ground floor plans, Kingsdale Secondary School





Chart 3.18. Auditorium inside of dome, Kingsdale Secondary School

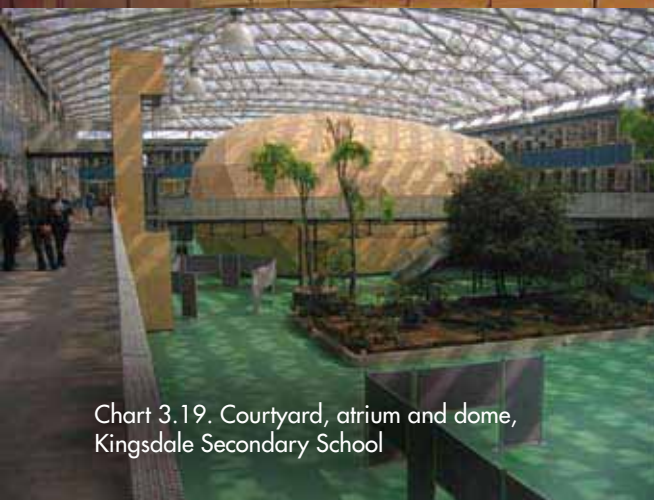


Chart 3.19. Courtyard, atrium and dome, Kingsdale Secondary School



Chart 3.20. Library, Kingsdale Secondary School



# Lilian Baylis Technology School & Community Learning Resource Centre, Lambeth

**Project objective** To build a new facility for community use to replace an aging school and to serve the needs of people with severe learning disabilities.

Educational and design concept		Design features
<b>Flexibility</b>		Flexible teaching areas are provided in naturally lit spaces in the atrium. Dining and assembly spaces can be combined and used for various gatherings and events. Classrooms contain moveable steel-frame walls for more flexible learning.
<b>New technologies</b>		The facility is equipped with the latest ICT equipment and modern music, drama and sports facilities. (See also page 18.)
<b>Accessibility</b>		The facility's location on the main road, back from Kennington Lane, provides a practical access and gathering point for all users of the facility. The Community Learning Resource Centre, which is located on the ground floor of the building, has its own entrance on the Kennington Lane frontage. The building's appearance is non-institutional and transparent. (See also page 24.)
<b>Comfort and sustainability</b>		The two teaching blocks and entry are visually connected via a top-lit atrium, which provides natural light to the circulation routes and open flexible learning spaces, primarily used for ICT. A variety of external spaces have been provided, ranging from the quiet courtyard to the large play area, with its amphitheatre for impromptu performance.

**Type of construction** *New building.* Lilian Baylis is located on the site of the old Kennington Depot on Kennington Lane, London. Students and staff from a nearby school, which has aged and inadequate facilities, will be transferred to the new school.

**Description of construction** The three-storey building with a reinforced-concrete frame is clad in brick and terracotta tiles. The "drum" staircase, which marks the corner entrance, and the canopy roofs of the atrium represent two strong architectural elements of this facility.

**Construction period** March 2003 – April 2005

**Level of education** Secondary (11–18 years), co-educational, 240 students with special educational needs (2003)

**Current enrolment** 608 (2004)

**Student capacity** 600

**Sponsors** Private funds were used to build the school, which will be repaid from public money under a Public Finance Initiative (PFI) contract. The private PFI company, FocusEducation – a joint venture between Bovis Lend Lease and Halifax Bank of Scotland – will be responsible for maintenance, catering, cleaning and waste disposal for a 25-year operating period of the facility.

**Design team** Ellis Williams Architects

**Cost of construction** GBP 20.4 million (public funds)

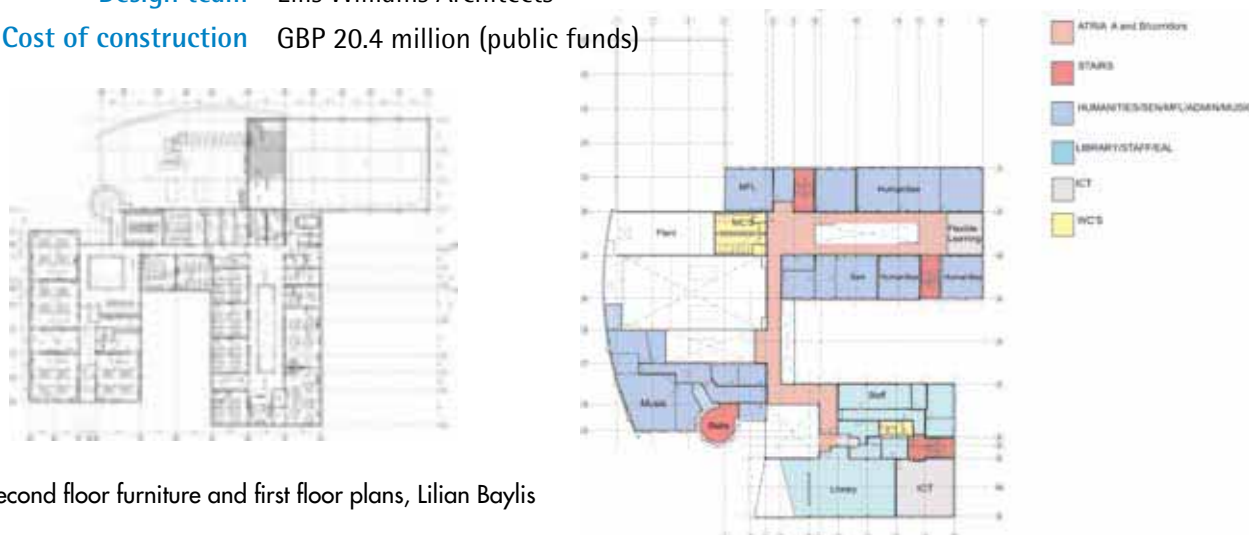


Chart 3.21. Second floor furniture and first floor plans, Lilian Baylis



Chart 3.22. Corner entrance, Lilian Baylis



Chart 3.23. Exterior façade, Lilian Baylis



Chart 3.24. Internal courtyard, Lilian Baylis



## Millennium Primary School, Greenwich

**Project objective** To create a new facility for the local community, where education, community and healthcare services are integrated into a single site for use all year round.

### Educational and design concept Design features

**New technologies** The school contains designated IT areas, and classrooms are equipped with electronic whiteboards, cabling and video conferencing software to link up with local schools and the Greenwich Grid for Learning.

**Accessibility** The early years centre and health centre, while architecturally integrated into the design and operation of the school, can function independently throughout the year, at nights and on weekends. Each class within the early years centre has its own designated external hard and soft play areas. The health centre provides a full range of primary care facilities. Family support is provided by the multi-agency office, and there is a wide range of adult education and training available. The school is designed to fully integrate children with special needs. It has disabled access to all parts of the complex, a personal care suite, large and small group rooms, assessment room, and toilets and parking for people with disabilities. The landscape to the south of the school and health centre, which contains a hall, small playgrounds and flood-lit sporting fields, is designed for both school and community use. (See also page 26.)

**Comfort and sustainability** The light and ventilation wells at the rear of classrooms, external retractable blinds, passive solar design and Termodeck system, in which tempered air passes through the hollow core of the pre-cast concrete floors, are used to optimise light, heating and ventilation. The building is constructed using robust materials that are self-finished to reduce maintenance costs. A series of paths have been planted to create an ecological trail with different habitats. The play areas have coloured patterns with structures to provide shade. The surrounding landscape hills were created from recycled material, the forms, colours and texture of which vary according to the season. (See also page 32.)

**Involvement of stakeholders** Architects regularly consulted with the head teacher and Greenwich Village community planners throughout the design process. Teachers and students were invited to view the building during the construction process.

**Type of construction** *New building.* The school replaced Annandale Primary School, an old, deteriorating neighbouring school.

**Description of construction** The site comprises three inter-connected buildings: school, hall and health centre. The two-storey steel framed classroom block and health centre rest on piled foundations with hollow pre-cast concrete plank floors and timber panel cladding. One feature of the school is the distinctive two-storey drums which house light wells, toilets, staircases, small group rooms and lobbies.

**Level of education** Pre-primary and primary (3-11 years), co-educational

**Current enrolment** 235 (2004)

**Student capacity** 446

**Design team** Edward Cullinan Architects

**Cost of construction** GBP 8 million (public funds)

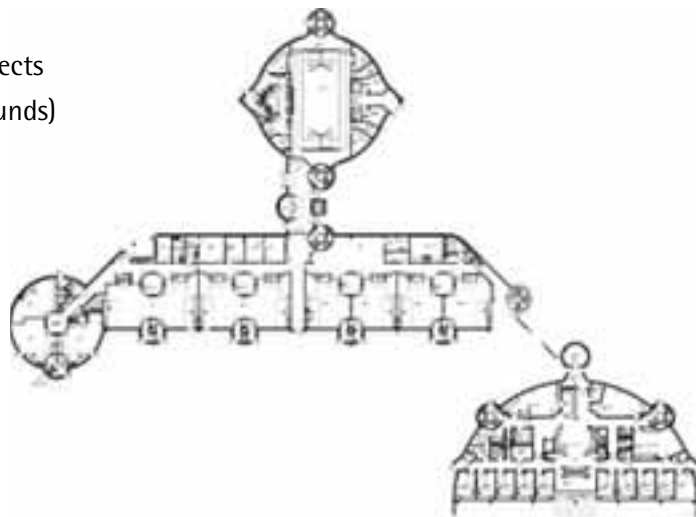


Chart 3.25. Section and site plans, Millennium Primary School





Chart 3.26. View from playground, Millennium Primary School

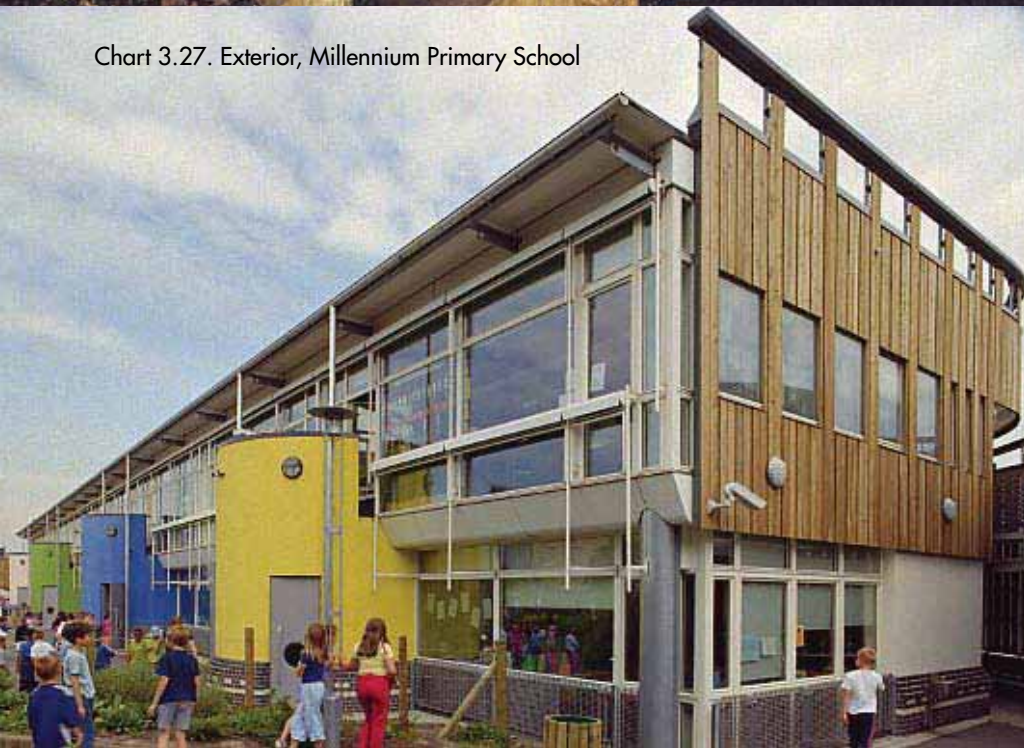


Chart 3.27. Exterior, Millennium Primary School



Chart 3.28. Interior drums, Millennium Primary School



## Royal Docks Community School, Newham

**Project objective** To implement Newham's policy of inclusive education for students with special educational needs, and to provide educational and training facilities to the community.

Educational and design concept		Design features
<b>New technologies</b>	Each classroom is equipped with at least five computers. Certain rooms have a larger floor area to allow each student to work on a computer with teacher supervision, with an interactive whiteboard at the front of the class.	
<b>Accessibility</b>	A pinwheel layout with a central ramp and four radiating wings links the two floors, enclosing a multi-purpose space for use by the school and wider community both day and night for exhibitions, performances, socialising and vocational training courses. Each of the four wings of the building is dedicated to one curriculum area, which can be closed off when required to facilitate after-hours community use. The radial plan permits a single controlled entrance, which is visible from surrounding roads, with no hidden or internal courtyards. All classrooms have glazed screens onto the corridor aimed at giving a sense of transparency to the school. (See also page 27.)	
<b>Comfort and sustainability</b>	The two storey top-lit atrium brings natural light deep into the school. To provide cross-ventilation in north and south wings, while avoiding ambient noise levels generated by traffic on nearby roads and passing aircraft from London City Airport, fresh air is introduced into rooms via acoustically-attenuated inlets below the windows. Used air is drawn from the rear of the room into vertical air ducts leading to the roof level, which also contains acoustic insulation. Potential overheating from the large windows is minimised through the use of exposed concrete floor slab, which absorbs heat during the day and is cooled at night through natural ventilation. Lighting in classrooms is turned off when daylight reaches the required levels or when a room has been unoccupied for some time.	
<b>Type of construction</b>	<i>New building.</i> Royal Docks replaces a school building constructed in the 1970s and a collection of prefabricated huts in the East London docklands. An archaeological survey revealed a pre-Roman settlement below the site, and an excavation was carried out before construction commenced.	
<b>Description of construction</b>	The site was formerly marshland, necessitating the construction of augured piles with a steel frame under a break layer of crushed concrete. Floors are pre-cast concrete planks. Floor loadings were minimised by the use of plasterboard partitions, ensuring better acoustic performance than concrete block work and greater resistance to vandalism.	
<b>Construction period</b>	October 1997 – September 1999	
<b>Level of education</b>	Secondary (11–16 years), co-educational	
<b>Current enrolment</b>	1 157 (2004)	
<b>Student capacity</b>	1 200	
<b>Sponsors</b>	GBP 5 million from the London Docklands Development Corporation (LDDC) and GBP 300 000 SRB (Single Regeneration Budget) funding	
<b>Design team</b>	Newham Council, Environment Department	
<b>Cost of construction</b>	GBP 20.3 million (GBP 15 million public funds and 5.3 million private funds).	



Chart 3.29. Exterior, Royal Docks



Chart 3.30. South-east wing from south, Royal Docks



Chart 3.31. ICT room in the east-wing atrium, Royal Docks



# St. Francis of Assisi Catholic Primary School, Kensington and Chelsea

**Project objective** To build a facility that is innovative in both its design and function.

## Educational and design concept Design features

**Learning tool** Equipped with the latest scientific equipment – telescope and mini-biosphere – learners are encouraged to actively construct knowledge through experience, action and conversation. These tools allow students to develop research and data collection skills, while also providing them with opportunities for scientific experimentation. At night, lighting from the two learning zones shines through the transparent structure, causing the building to glow and illuminate its surroundings. (See also page 42.)

**Comfort and sustainability** A building management system (BMS) transmits data on CO<sub>2</sub> levels and energy consumption to students to help them monitor the health and efficiency of their learning environment. The playground on which the facility is located has been transformed into an outdoor classroom demonstrating sustainability.

**Type of construction** *New building.* The building is located on a section of St. Francis of Assisi Catholic Primary School's playground. The area was raised and covered to provide a new play area for children.

**Description of construction** The facility, which is a "Classrooms of the Future" project, contains four elements: a permanent classroom for 30 children, which is housed in a double curved stressed timber skin; a lightweight, steel-framed EFTE-cushioned conservatory; two learning zones or ancillary classrooms for small groups and visitors; and an observatory consisting of a prefabricated rotating dome and a remote-controlled telescope. The classroom and learning zones have electronic access to the telescope.

**Construction period** June 2002 – June 2003

**Level of education** Pre-primary and primary (3-11 years), co-educational

**Current enrolment** 295 (2005) (school)

**Student capacity** 40 (facility only)

**Design team** Studio E

**Cost of construction** GBP 750 000 (public funds)

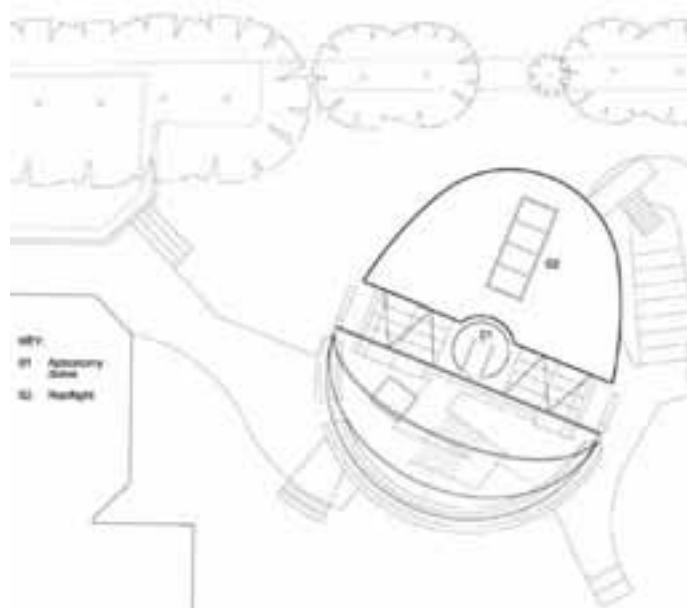
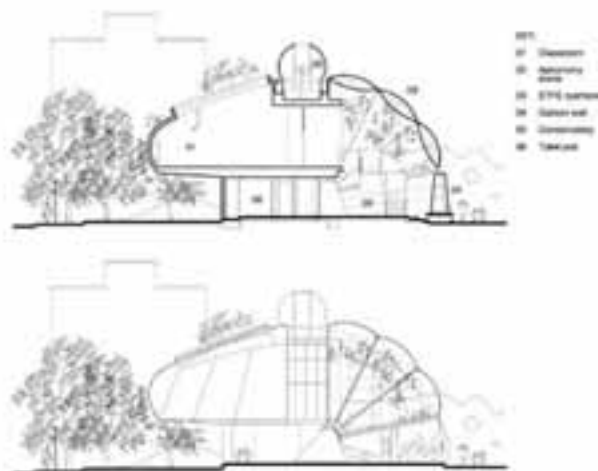


Chart 3.32. Elevations and roof, St. Francis of Assisi



Chart 3.33. Drawing by Fred Gonzales  
from St. Francis of Assisi

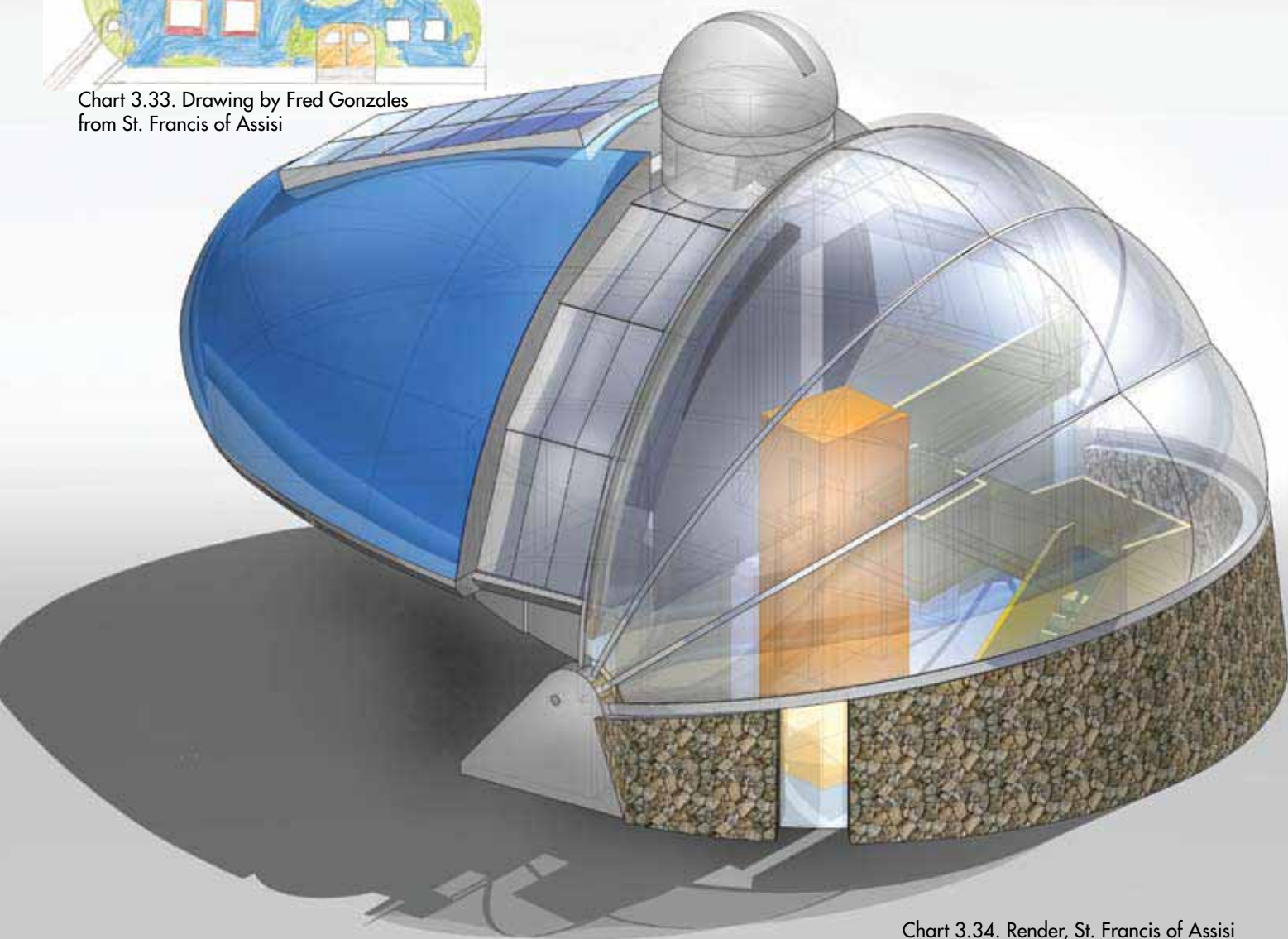


Chart 3.34. Render, St. Francis of Assisi

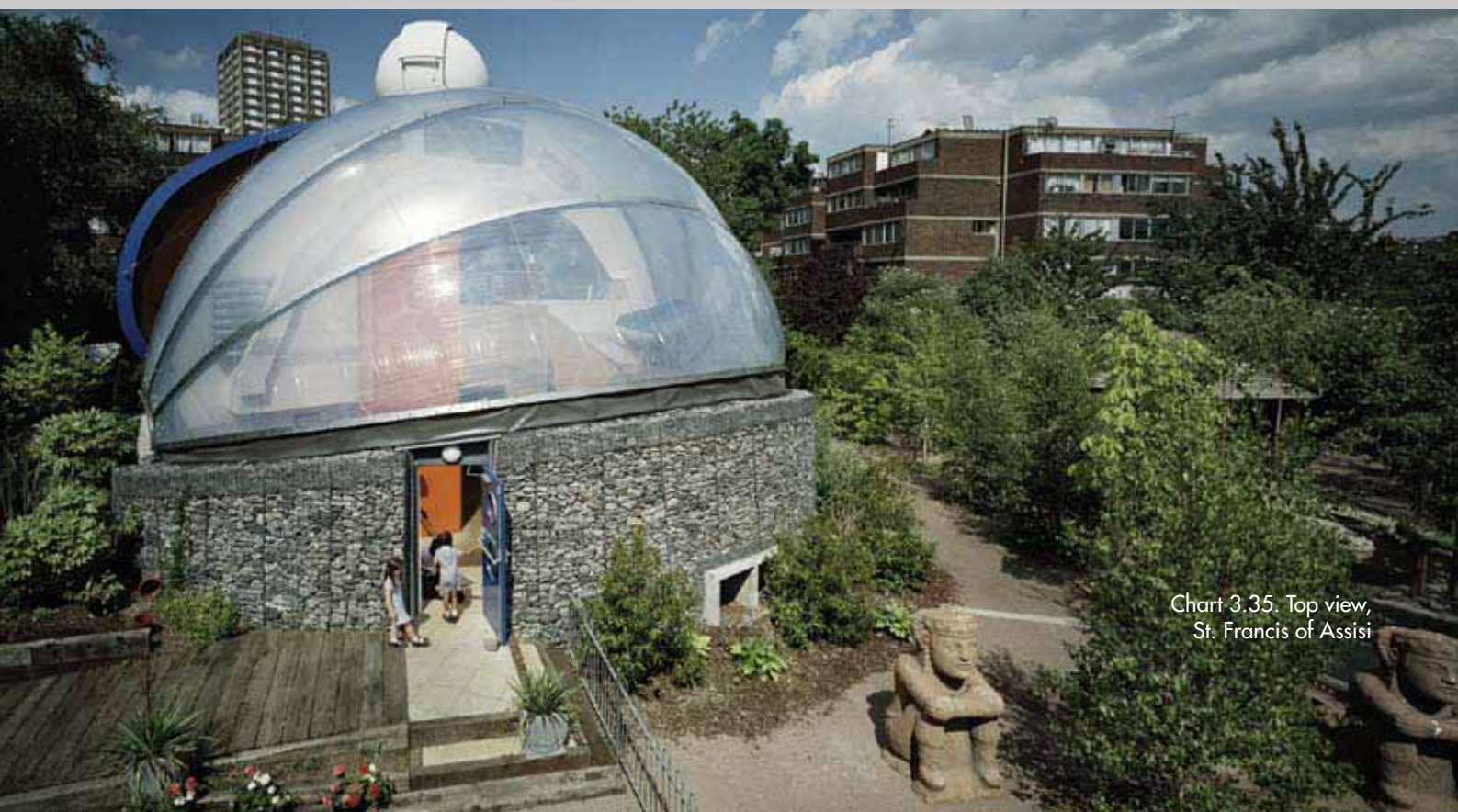


Chart 3.35. Top view,  
St. Francis of Assisi



## Tanaka Business School, Imperial College, Kensington and Chelsea

**Project objective** To design a state-of-the-art building to serve as a new entrance to the prestigious Imperial College and as a communal space for staff and students from multiple disciplines.

Educational and design concept		Design features
<b>Openness</b>	A range of spaces is provided for students and staff. The forum is the social hub of the school; the area is light and airy, and contains a café, bar and multiple e-mail terminals with plasma screens. Vaults constructed in the 19 <sup>th</sup> century, which were discovered in the course of the building project, now offer space for quiet conversation and study. "Syndicate zones" or breakout spaces surround lecture halls.	
<b>New technologies</b>	Seven lecture theatres as well as traditional and Harvard-style amphitheatres, which are contained within the building's drum structure, are equipped with the most advanced technologies. (See also page 20.)	
<b>Stakeholder involvement</b>	The school established a user group comprising academics, administrative staff, the project team and architects, which met regularly throughout the project. Imperial College formed a steering group, in which the school principal played a central role.	
<b>Type of construction</b>	<i>New building.</i> The new building unifies three disciplines: technology, medicine and science.	
<b>Description of construction</b>	The school is divided into two parts. The office area is located on three floors in the Goldsmiths' Wing, Royal School of Mines. The new school serves as the teaching facility and the new college entrance. It is cloaked within a protective envelope, creating an atrium space or forum. A six-storey circular stainless steel drum containing circular lecture theatres rises out of the forum space.	
<b>Construction period</b>	September 2002 – June 2004	
<b>Level of education</b>	Post-secondary (over 18 years)	
<b>Current enrolment</b>	662 (2004)	
<b>Student capacity</b>	639 seats in the lecture theatres, plus desk space for 70 full-time PhD students	
<b>Sponsors</b>	Gary Tanaka, former student	
<b>Design team</b>	Foster and Partners	
<b>Cost of construction</b>	GBP 15.7 million (private funds)	



Chart 3.36. Section and roof plans, Tanaka Business School



Chart 3.37. Exterior by night, Tanaka Business School



Chart 3.38. The forum, Tanaka Business School



Chart 3.39. Staircase, Tanaka Business School



## Watergate Primary Special School, Lewisham

**Project objective** To build a new school that caters for young people with profound multiple learning difficulties.

Educational and design concept		Design features
<b>Flexibility and openness</b>	The school has a generous floor area of 4 000 m <sup>2</sup> . The upper level houses the main teaching areas, which are built around a courtyard that opens on one side to provide secure access for the arrival and departure of students by bus. The courtyard also serves as a play area for students during the day. The classrooms are deep plan, with sliding folding doors along their length for storage, a moveable carpet, an area for two to three computers, adjustable height furniture and sinks. The dining and sports halls are divided by folding doors. (See also page 13.)	
<b>Specialised spaces</b>	Separate therapy and class bases are provided for students with profound multiple learning difficulties. In addition to physiotherapy and training rooms, there are therapy rooms, including one white and one dark sensory room and a soft play room; an infant and junior suite for students with autism; and a large hydrotherapy pool. The school also contains a library, project rooms, art and technology rooms, and music rooms.	
<b>Accessibility</b>	Both wall, ceiling and floor space are maximised through the installation of under floor heating; a double height main entrance; long, 2.6 m-wide corridors with hand rails on one side; and deep-plan bays off the corridor for mobility equipment. Hoists lead from the changing rooms to the hydrotherapy pool, which is shared with the community and a local secondary school. Toilets and changing areas are also equipped with hoists.	
<b>Involvement of stakeholders</b>	The Local Education Authority initiated a team-based multi-party approach, known as a partnering/design build contract, in the design and construction of this school. The head teacher had a large input in briefing and specification.	
<b>Type of construction</b>	<i>New building.</i> The school replaces a converted secondary school in poor condition.	
<b>Description of construction</b>	The school is located on a sloping site. It has two levels. The lower ground floor contains accommodation for staff, doctors, nurses and therapists, and training rooms for outreach workers. The upper floor consists of nine mono-pitched classrooms with an acoustic profiled metal roof and exposed steel beam with a sloping ceiling from single to double-storey height, and a number of specialised spaces. Internal finishes include an exposed metal roof deck, white painted walls, dark blue laminated doors with double door handles and light blue vinyl floors.	
<b>Construction period</b>	August 2001 – March 2003	
<b>Level of education</b>	Primary (3–11 years), co-educational	
<b>Current enrolment</b>	64 (2004)	
<b>Student capacity</b>	90 students with severe and multiple learning difficulties	
<b>Design team</b>	FM Modern Design	
<b>Cost of construction</b>	GBP 4.5 million (public funds)	



Chart 3.40. Hydrotherapy pool,  
Watergate Primary Special School



Chart 3.41. Classroom, Watergate Primary Special School



Chart 3.42. Entrance, Watergate Primary Special School



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## CONCLUSIONS

Today, many countries are facing similar issues and challenges in school design. To better prepare for the future, policy-makers, designers, the school community and the construction industry must work together to ensure quality educational facilities.

### Issues in planning tomorrow's schools

The following issues can be identified to effectively plan a new school:

- **Research.** Review the latest literature on school design, and conduct visits to new and existing schools.
- **Education policy.** Analyse the social, cultural, economic and education policy context of the new school; identify the preferred pedagogical model (*i.e.* instructional or creative) of the authority commissioning school construction; and examine clients' attitude towards the role of ICT and sustainability issues.
- **Organisation.** Consider the organisation of the new school in terms of the provision of social and learning spaces for individual learners and for small and large groups (*e.g.* group size, group compositions, number of groups, and types and frequency of learning and other activities).
- **Gathering views.** Consult with teachers and students on their vision of the new building and its environment.
- **Learning opportunities.** Examine how the new building, its services and landscape could be used as a teaching tool.
- **Flexibility.** Ensure that the design allows sufficient flexibility for future operational and pedagogical changes.
- **Access.** Determine the nature and level of involvement of the school community in the design process, and consult existing regulations on school access for people with special educational needs.
- **Cost.** Examine the cost of schools of a similar type and size, both nationally and internationally.

### Considerations for tomorrow's design and construction process

Clients and design teams should consider the following prior to the design phase:

- **Character.** Define and publicise the special qualities that will create the "character" of the new school.
- **Procurement.** Consider the procurement method for the new school's design and construction to ensure a link between the construction and subsequent maintenance of the facility.
- **Flexibility.** Define the degree of flexibility required in the design brief.
- **Design team.** Select a multi-disciplinary design team, through a competitive process, which includes a quality assessment or interview; and use design specialists such as landscape architects and services engineers to provide design guidance.
- **Design quality.** Evaluate the quality of the design at various stages in the design process using a method that involves all stakeholders.
- **Communications.** Establish a mechanism by which clients can communicate their aspirations to the design team; delegate one member of the client and design teams to co-ordinate the design and report back regularly to both groups on progress; ensure that students and teachers understand the opportunities presented by the new building through, for example, workshops and visits; and ensure that all the stakeholders have ownership of the final design solution, which may involve workshops and presentation techniques such as computer generated flythroughs.
- **Budget.** Establish a clear, realistic and comprehensive budget for construction and equipment costs, including annual maintenance costs.
- **Programme.** Allow sufficient time within the building programme to ensure design quality and stakeholder consultation: time invested at the planning stage will pay dividends throughout the life of the building.



## Suggestions for tomorrow's construction industry

In some countries, such as the United Kingdom, there is concern that the substantial increase in school building investment could overwhelm the country's construction industry. Possible remedial action could include the following:

- **Off-site construction.** Encourage the industry to adopt and invest in off-site construction methods, such as pods and/or prefabricated wall, roof and floor panels which could deliver high quality components in large quantities to sites.
- **Flexibility.** Build a degree of flexibility in all construction methods to allow for changes in the configuration of learning spaces in daily school activities and future learning environments.
- **Sustainability.** Incorporate sustainable materials and servicing systems, minimising the building's impact on the earth's resources.
- **Learning opportunities.** Encourage the use of the building fabric, environmental services and landscape as an educational resource; and employ simple and transparent construction methods and materials to facilitate students' and teachers' understanding of school construction and operation.
- **Buildability.** Choose cost-effective construction methods that do not compromise building quality, rather than complicated, expensive, site-based methods.

## Further work

Although there is a wealth of innovative ideas and practice on new and existing school design, further research and development is needed to address the challenges of future school design, renovation and construction:

- **Costs.** Investigate the costs of new school buildings, nationally and internationally, by comparing cost variations and cost-effectiveness of new facilities.
- **Educational outcomes.** Further analyse the relationship between educational outcomes (*i.e.* the educational returns on increased investment in school building quality) and the quality of the built environment; and identify a research methodology that can better gauge the strength and variables that influence this relationship.
- **Advice from education specialists.** Use education specialists to advise those who commission and design new school buildings on the impact of trends in educational pedagogy and process, including the use of ICT, on future school provision, including how to obtain best value for money from increased levels of investment in education facilities.
- **Participation.** Encourage teachers, parents and students to work with designers to develop shared visions and understandings of school design.
- **Evaluation of design quality.** Develop a tool that evaluates the quality of design according to stakeholders' needs and visions of quality, allowing comparisons of performance between a range of designs, construction methods and costs.

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